XEROX

Xerox University Microfilms
Ann Arbor, Michigan 48106

WESTERN AMERICANA

Reproduced from the original in the collection of
THE HENRY E. HUNTINGTON LIBRARY AND ART GALLERY

Muscat of Alexandria Raisin Grape, First Crop. One-half Natural Size.

THE RAISIN INDUSTRY.

A PRACTICAL TREATISE

ON THE

RAISIN GRAPES,

THEIR HISTORY, CULTURE AND CURING.

BY GUSTAV EISEN.

SAN FRANCISCO:
H. S. CROCKER & COMPANY, STATIONERS AND PRINTERS.
1890.

Entered according to Act of Congress, in the year 1890, by
GUSTAV EISEN,
in the office of the Librarian of Congress, at Washington.

PREFACE.

OF late years the raisin industry has been prominently before the horticulturists of California. Many people now make their living and acquire wealth by the cultivation of the raisin grapes, and many are now studying the methods of cultivation, pruning, curing and packing while waiting for their vines to bear. The literature of the raisin industry is a very scant one, and, with the exception of a few notices in works of travel, or in treatises on general fruit culture, we find not a single book in which this important and interesting industry is made the special subject of study and discussion. A book on the raisin industry may, therefore, be considered timely. I have endeavored to so write it that it would contain something of interest to all those connected with the growing and curing of the raisin grapes, to those who have already succeeded in building up fame and fortune, as well as to those who have just begun the cultivation of the vine, and who have as yet only realized the pleasures, but not the profits, of the industry. The historical part of the book will principally interest the former; for the latter the practical part on cultivation, pruning, curing and packing is intended.

As our climate and other conditions differ from those of any other country in the world, so must our methods of cultivation and curing differ from those practiced elsewhere. Foreign methods, while interesting and, in some respects, of great importance to us, had to be greatly modified and improved upon before our growers succeeded in producing raisins equaling the best from the raisin districts of the Old World. It has cost years of experimenting and study to attain success, as well as much money and disappointment to many who had nothing to guide them when they commenced.

These processes by which success was achieved can now become the property of all, and a safe guide to even the most inexperienced beginners. The methods advocated here are the result of practical experience of the author, as well as of the most successful raisin-growers of this State.

For the benefit of those of our readers who now study the raisin industry at a distance, but whose steps may in the future be directed to this Coast, a descriptive tour through the raisin districts of our State has been added in order that they may see what our country is like,—the country of the raisin and the fig; the country of almonds, olives, oranges and prunes; the country where health, profit and enjoyment are more than anywhere else derived from horticultural pursuits. It is for these prospective readers, that the short biographical sketches of our principal raisin-men are intended,—short records of the pioneers of the raisin industry,—men who have broken the way which is now easy to travel, and through whose experience and perseverance others are now being benefited.

GUSTAV EISEN.

SAN FRANCISCO, CAL., OCTOBER, 1890.

TABLE OF CONTENTS.

PAGE.
HISTORICAL 5
Raisins 5
The Currant 6
Muscatels. 7
Dehesa Raisins 7
Lexias or Lye-dipped Raisins 9
Various Kinds of Raisins 10
— Muscatels; Currants; Belvideres; Black Smyrnas; California Malagas; California Sun-dried Sultanas; Seedless Muscatels; Thompson Seedless; Dried Grapes; Lexias; California Dipped; Smyrnas; Faros; Huascos.
RAISIN DISTRICTS 10
Foreign Districts 10
Raisins in Ancient Times 10
Modern Raisin Districts 11
The Malaga District 12
— Extent and Age; Climate; Soil; Location of the Vineyard; Varieties of Grapes; Characteristics of the Raisins; Yield of Grapes; Distances of the Vines; Pruning; Manuring and Fertilizing; Drying Floors or Sequeros; Drying and Curing; Packing; Labor.
Valencia and Denia 15
— Extent of the District; Soils and Appearance of the District; Climate; Irrigation; Quality of the Raisins; Planting and Care; Dipping and Scalding; Drying and Curing; Packing and Disposing of the Crop; Export and Production.
Corinth and Currants 22
— Historical and Geographical Notes; Characteristics and Quality; Soil and Irrigation; Preparation of the Land; Distances of the Currant Vines; Care of Cuttings, Planting and Grafting; Pruning the Vines; Care of the Vineyard; Ringing the Branches; Drying and Curing; Cost of Currant Vineyards in Greece; Consumption and Production.
Smyrna Raisins 30
— Districts in Smyrna; Climate; Care of the Vines; Dipping, Drying and Curing; Production and Export; Cost of Vineyards in Smyrna; Other Varieties of Raisins.
Italy and Italian Raisins 36
— Lipari and Belvidere; Pantellaria; Calabria.
Chile and Huasco Raisins 36
— Characteristics; Location; Varieties; Soils; Climate; Irrigation; The Vineyard; Drying and Curing.
California Raisin Districts 38
A General Review 38
— Early History; Later Planting; Acreage and Crops.
Yolo and Solano 40
— Soil and Climate; The Vineyard; The Crop.
Northern California 43
— General Remarks; Placer County; Yuba County; Sutter County; Colusa County; Butte County; Tehama County; Shasta County.
Fresno, Merced, Tulare and Kern 44
— Extent and Location; Soils and Climate; Irrigation; The Vineyard; Pruning and Other Operations; The Crop.

San Bernardino County 48
— Location and Acreage; Climate; Irrigation; Soils; The Vineyard; The Crop; The Profits and Other Items.
Orange County and Santa Ana 52
— General Remarks; Location; Climate; Soils and Ripening; The Vineyard; The Crop and its Curing; Yield and Profits.
San Diego and El Cajon 55
— Location and Acreage; Climate and Rainfall; Soils; The Vines and the Vineyard; The Crop.
Other Raisin Districts 59
CLIMATIC CONDITIONS, SOILS, LOCATION AND IRRIGATION 60
Climatic Conditions Favorable and Unfavorable to the Raisin Industry ... 60
— Limits of the Raisin Districts; Dry Seasons, Spring and Fall Rains; Winter Rains; Frost in Spring and Winter; Summer Temperature; Winds, Injurious and Beneficial; Fogs and Moisture in the Air; Ideal Conditions of Climate.
Soils 67
— General Remarks; Malaga; Valencia and Denia; Smyrna; Zante; Chile; Fresno; Other Soils in San Joaquin Valley; Orange County; Redlands and Riverside; El Cajon; Subsoils; Hardpan Soils; Comparative Value of Soils; Alkali Soils; Fertilizing.
Irrigation 77
— Introductory Notes; the Necessity of Irrigating the Raisin Vines; Health and Longevity of Irrigated Vines; The Bearing Quality of Irrigated Vines; Quality of Irrigated Grapes; Various Methods of Irrigation; Irrigation by Flooding; Irrigation by Furrowing; Subirrigation; Seepage; Drainage The Influence of Irrigation on the Soil.
The Raisin Grapes 87
— Introductory Notes; Muscatel or Gordo Blanco; Muscat of Alexandria; Huasco Muscat; Other Varieties of Muscat; Seedless Sultana; Black Currant; Other Varieties of Currants; Thompson Seedless; Other Seedless Grapes; Malaga; Feher Szagos; Other Raisin Grapes.
DISEASES AND INSECT PESTS 93
Powdery Mildew or Uncinula 93
— General Notes; Characteristics; History and Distribution; Remedies.
Downy Mildew or Peronospora 95
— General Notes.
The Vine Plague 96
— Characteristics; Nature and Cause; Damages; Remedies.
Leaf-hopper 98
— Characteristics; Damages; Distribution; Remedies.
Red Spider 100
— Characteristics; Remedies.
Caterpillars 100
— Characteristics; Damages; Remedies.
Black-knot 102
— Characteristics; Remedies.
Grasshoppers 102
— General Notes; Remedies.
THE RAISIN VINEYARD 104
Planting 104
— Distances for Muscat Vines; the Marking Out of a Vineyard; Relative Value of Cuttings and Rooted Vines; The Making of Cuttings; The Care of Cuttings; Planting Cuttings; Care of Young Cuttings; Transporting Cuttings to Distant Parts; Rooting Cuttings; Care of Rooted Cuttings; Planting Rooted Vines; Proper Time for Planting; Cost of Cuttings and Rooted Vines; Winter Plowing; Plowing Devices; Cultivation; Back-furrowing; Cross-plowing; Weed-cutters; Cutter-sled; Hoeing; Time for Cultivation.

Grafting the Muscat on Other Stocks 117
— Time for Grafting Raisin-vines; Points to be Observed in Grafting; Various Methods of Grafting; Stocks and their Influence.
Various Summer Work 121
— Sulphuring; Tying Over; Covering the Vines; Thinning the Crop; Ringing the Vines; The Vineyard Labors of the Year.
Pruning 124
— Winter Pruning or Pruning Hard Wood; Bleeding of the Vines; Summer Pruning or Pruning Green Wood; Root-pruning; Suckering.
Various Vineyard Tools 130
— General Notes; The Sheep's-foot; The Planting-bar; The Dibble; Planting Chains; Spades; Hoes; Plows; Cultivators; Randel Disc Cultivators; The Ash-trough; Sulphuring Cans and Bellows; The Cutter-sled; Vineyard Trucks; Shears.
DRYING AND CURING 133
California Sun-dried Raisins 133
— Notes; Time of Ripening; Signs of Maturity; Picking; Cleaning; Drying on Trays; Turning; Reversing; Slanting the Trays; Elevating the Trays; Stacking Against Rain and Dew; Taking Up; Covering; Drying-floors; Dryers; Sweatboxes; Trays for Drying.
California Lye-dipped Raisins 149
— General Notes; Dipping Process; Drying and Curing; Stemming, Grading and Packing.
THE PACKING-HOUSE 153
Buildings and Mechanical Appliances 153
— The Packing-house; The Stemmer and Grader; The Sweating-house; The Presses; Boxes and Cartoons; Packing Frames and Packing Trays; Facing-plate; Scales; Labeling Press; Tables; Bags and Bagholders; Trucks; Trays for Weighing; Followers; Paper; Tin Boxes.
Loose Raisins 158
— Stemming and Assorting; Packing and Cleaning; Sacking; Facing, Top-up Method; Facing, Top-down Method; Comparative Value of the Two Methods.
Layer Raisins 162
— Sweating and Equalizing; Packing Layers, Top-up Method; Packing Layers, Top-down Method; Filling; Nailing and Trimming; Labels.
STATISTICS OF IMPORTATION, PRODUCTION AND PRICES 169
— Production of Raisins in California from 1873 to 1889; Number of Acres in Raisin Grapes in California in 1890; California and Malaga Prices, Importation, etc., from 1871 to 1889; Exports of Malaga Raisins from 1864 to 1889; Exports of Valencia Raisins from 1850 to 1889; First Cost of Crop of Valencia Raisins; Production and Distribution of Smyrna Raisins from 1844 to 1884; World's Raisin Production in 1890; Importation of Raisins, Currants and Figs into the United States from 1873 to 1878; Importation of Raisins, Currants and Figs into the United States from 1879 to 1888; Consumption of Currants and Raisins per Head of Total Population in 1884; Prices Ruling in the California Raisin Districts.
THROUGH THE CALIFORNIA RAISIN DISTRICTS 181
Through San Joaquin Valley to Fresno 181
From Los Angeles to Santa Ana 189
From Santa Ana to San Diego 192
El Cajon 195
Riverside 199
Redlands 202
An Hour in a Packing-house 205
RAISIN-GROWERS AND THEIR VINEYARDS 208
— G. G. Briggs; R. B. Blowers; Robert McPherson; T. C. White; Miss M. F. Austin; Joseph T. Goodman; A. B. Butler; William Forsyth; A. D. Barling; San Joaquin Valley Raisin Packers of 1889.
LITERATURE 215
— Introductory; List of Books of Reference.
GENERAL INDEX 219

THE RAISIN INDUSTRY.

A PRACTICAL TREATISE ON THE RAISIN GRAPES, THEIR HISTORY, CULTURE AND CURING, WITH SPECIAL REFERENCE TO CALIFORNIA,

BY GUSTAV EISEN.

Copyrighted.

HISTORICAL.

RAISINS.

The word "*raisin*," as spelled and pronounced to-day, is not of very ancient origin, but rather a corruption and evolution of older words, both spelled and pronounced differently. Thus Falstaff replies to Prince Hal: "If reasons were as plentiful as blackberries, I would give no man a reason upon compulsion" (Henry IV, Act II, scene 4). Also, Cooper, in his dictionary of 1685, indicates that "*raisin*" and "*reason*" are of identical sounds. The derivation of the word has, again, been very variously suggested either from "red" or "rose" color, connecting it with the German and Danish word "*rosine*;" and it has even been suggested that the word was derived from the fact that the raisins were cured in the "rays" of the sun. The true derivation, however, is from the Latin word "*racemus*," meaning a bunch or cluster. Richardson, who first points out this derivation, quotes: "Whether a reisyn (E. V. graap, *racemus*) of Effraym is not better than the vindages of Abiezer" (Wicliffe Judges VIIJ, 2). "And there shall be left in it as a rasyn" (E. V., braunches of a cluster). Marginal note, "A rasyn is a lytil bow with a lytil fruit" (Idem. Is., XVIJ., 6). But we have much older testimony of this derivation being the correct one. An old document states that, in 1265 A. D., the Countess of Leicester paid in London twelve shillings for fourteen pounds, or, as the statement reads in Latin, "*Pro uno fraello racemorum;*" which, translated, would be, "for one frail of bunches." The evolution of the Latin word *racemus* was thus seen to have been accomplished rapidly enough; but, on account of the illiteracy of the olden times, it was spelled and pronounced promiscuously. Thus we meet with such spellings as "*reysyns*," in 1266; "*reysons*," in 1447 ("Russell's Book of Nurture"). In 1554 the *Stationers' Company* in London paid twopence for one pound of "*greate reasons;*" while Andrew Borde, in his "Dietary" of 1542, says that "*great raysens be nutrytyve, specyally yf the stones be pulled out.*" In 1578 Dodoens speaks of dried raysens. In 1685 the word "raisin" is used and spelled as in our days, and from that time on the different spellings were used, if not promiscuously, still without any great uniformity. The term of "greate raysens" was introduced to distinguish them from the smaller raisins, or currants. In our own days, the latter is seldom classed or alluded to as a "raisin" proper, although it, strictly speaking, should be considered as such. The tendency at present in California is to make the distinction between "raisins" and "dried grapes," meaning by the former certain varieties of grapes which have been skillfully dried and cured, and which are superior in taste, flavor, thinness of skin and saccharine matter. "Dried grapes," again, are simply any kind of grape, especially wine-grapes, which have only been dried, and which have not undergone that skillful treatment which the grape-grower is so proud of, and justly enough designates as "curing." They are an outgrowth from the late efforts of the French wine merchants to make genuine French wine out of anything that is sweet, and as they are immensely preferable to beets, potatoes and glucose, they will always be in demand.

With the above definition of the "raisin" accepted, we can proceed to consider their different varieties, their names and derivations. The old designations of the different varieties were derived from the places where they were produced, without special reference to the grapes from which the raisins were made. Thus we had Malagas, Currants, Valencias, Denias, Turkish and Italian raisins. But since it has been found that the same kinds of raisins have been produced in very different localities, and that some localities can produce all the different kinds, a new division has been found necessary. Thus, disregarding the many various brands with which this and other markets are flooded, the following different varieties of raisins will be found the principal ones: *Currants, Muscatels, Dipped and Sultana.*

THE CURRANT.

The *currant* is one of the very oldest raisins known. As early as 75 A. D. Pliny speaks of the fine grapes grown in Greece, the berry being thin-skinned, juicy and sweet, and the bunch being exceedingly small. This, then, must be the currant of later times. After this first mention of this grape, the same drops out of history for ten centuries, and the name currant is first to be identified with raisins de Corauntz, or rather, "reysyns de *Corauntzs*" as late as 1334. As early as the eleventh century, a lively traffic in this kind of raisins had taken place between the Greek producers, the *Venitians* and other of the Mediterranean merchant nations. In 1334 we find them called "corauntz;" in 1435, "corent;" and old MS. of the Grocers' Company in London, speaks of "x butts and vi roundelletts of resins of Corent." Thus spelled, the name was used for years. In 1463 "reysonys of Corawnce" were three pence per pound, and in 1512 the Duke of Northumberland paid two pence per pound for rasyns of Corens. In 1554 the name had changed to currans, and the Stationers' Company provided for a banquet "5 punde of currans at one shilling and eight pence." In 1558 the same company provided for "6 punde of currance for 2 shillings." In 1578 we find in

Lytes' translation of Dodoen's "Herbal," in the description of different varieties of vines, that "Small raysens, commonly called Corantes, but more rightly raysens of Corinthe. The fruit is called in the shoppes of the countrie,* passulae de Corinthe; in French, raisins de Corinthe; in base Almaigne (Dutch) Corinthea; in English, Currantes, and small raysens of Corynthe." Here, then, is indicated for the first time that the true and correct name should be "raisins of Corinth." But we need not follow this evolution any longer; there can be no possible doubt that the name *currant*, the one now accepted for this class of raisins, is derived from the town of Corinth, on the mainland of Greece,—the Morea of our days, the Peloponnesus of the ancients. Until the time when the Turks conquered Greece, the port of Corinth was the principal point of export for this class of raisins, and while, after the subjection of Greece this commerce entirely ceased, still this fruit always continued to bear the name by which it first became known to commerce.

MUSCATELS.

The principal and most valued class of raisins are the Muscatels or Muscats. They all derive their name from the Muscatel or Muscat grape, from which these raisins are made. As to the origin of the name Muscat, opinions differ. The most popular one is that the grape got its name from the supposed musky flavor peculiar to this variety of grape. It is, however, far more likely that the name is a very ancient one, and derived from the Latin word *Musca*, meaning a fly,—these fine grapes when drying being especially attractive to flies. The Romans called this grape, "Uva Apiaria," meaning bee grapes, or grapes beloved by bees, from the fact that the bees are especially attracted to these grapes when they are being dried. The Muscat or Muscatel would then not originally designate a certain variety of grapes, but grapes used for drying generally. In the course of time the name was transferred to or especially given to the *best* grape for drying purposes, —the Muscatel of our own times.

DEHESA RAISINS.

The finest or at least the most expensive brand of raisins made is the *Dehesa* raisin of Malaga. They are produced from the Muscatel variety and the name they bear has an interesting origin, giving us at the same time an insight in the development of the agricultural and horticultural resources of Spain. The word "Dehesa" is found by reference to a good Spanish dictionary to mean pasture ground. The "Dehesa" raisins then are pasture-ground raisins, or raisins grown on former pasture ground. The way the raisins came to be given such a name is as follows. Between the years 800 and the end of the fifteenth century, the fairest part of Spain as well as Portugal was occupied by the Moors. Contrary to their nature in other countries, they proved here extremely industrious, and excelled both as merchants, artisans and agriculturists. The waters of the streams were conducted to the land in aqueducts, dams were thrown across the rivers, reservoirs were formed, and the whole of Southern Spain became most highly cultivated, rich and prosperous. In fact, if the historians are to be believed, and the yet remaining views of former grandeur can be trusted, no country either in ancient or modern times has ever in prosperity rivaled the ancient Moorish kingdoms of Granada and Andalusia. In the thirteenth century the christian knights and kings of Central and Northern Spain succeeded in conquering the Moors, who again were unmercifully expelled, massacred or enslaved, their cities burned and razed, and the fertile and cultivated districts utterly ruined. Vast tracts were depopulated and abandoned, and, nature taking its course, wild grass, shrubbery and trees soon covered the former highly cultivated plains. In the course of time these uncultivated lands attracted the attention of the highland shepherds, who drove their herds to them during the winters, again returning to the mountains at the advent of the dry season.

---

* Holland, Dodoens was a learned Dutch botanist.

By degrees the self-taken rights of the sheepmen became more widely recognized, and, while the less valuable lands were taken possession of by the poorer peasantry, these pasture lands were set apart for the exclusive use of the sheep-owners. The pasture lands thus being free, it was no wonder that the sheep industry flourished, and that the flocks increased. The wool industry soon became one of the most important in Spain. The flocks were principally owned by nobles and monks, and the poor peasants, who constituted the only agricultural population, had very little if any chance to oppose the ever greater encroachments of the wandering flocks or their insolent owners. The Merinos, or moving sheep, were wintered in the warm valleys of Andalusia, Murcia and Estremadura, only to be again removed to the cooler mountains of Leon and Castille at the advent of spring. What curse this would entail on the agricultural population is easy to be seen. The sheep were moving in bands of 10,000 each, and 700 to 800 such flocks were moved annually twice through a country devoid of fences or inclosures of any kind. Numerous disputes and constant bloody fights arose between farmers and the shepherd, to settle which the "Council of the Mesta" was instituted. In tyranny, this dreaded institution was only equaled by the famous Inquisition, with which in birth and death it was almost contemporaneous. In the year 1556 a code of laws was promulgated, and a compromise was entered upon. But the tyranny of the shepherds, upheld through their "Mesta," was in no way diminished. The latter continually extended its power, encroached upon new territory, appropriating gradually the finest pastures of Spain, and finally obtained a monopoly of the wool trade. Its tyranny became at last intolerable. The shepherds of the Mesta were more dreaded than robbers and highwaymen in every place througn which they passed. Agriculture became almost impossible. At last the "Mesta" was abolished by the Cortez in Cadiz in 1812, and a few years afterwards the pastures or Dehesas were sold. One of the finest Dehesas near Velez, Malaga, was planted to Muscatel grapes, and through the combined fertility of the soil, and the abundance of moisture, the vineyard proved a great success. So fine were the grapes grown there that they attracted great attention; no such fine grapes had ever been seen in Andalusia before. The merchants to whom the first raisins were sold were much astonished, and wonderingly asked whence they came. The reply, "from the Dehesa," was from that time on applied to the finest Muscatel grapes.

LEXIAS, OR LYE-DIPPED, AND OTHER RAISINS.

The third class of raisins are the *dipped* raisins, so called from being dipped in boiling lye before being dried and cured. The Spanish name for these raisins is *Lexias*. The name *Lexia* is, again, derived from a more ancient word, the Latin *lixivium*, or *lixia*, meaning *lye*. To-day the continental name for this class of raisin is *Lexias*, when the more specific names of Denias and Valencias are not used. Here, in America, we generally use these names, and whenever we speak of Valencias and Denias we mean the dipped raisins of these districts. To the above three classes of raisins we might appropriately add Sultanas and Malagas. The Sultanas are made from the Sultana grape, a seedless grape from Asia Minor, now grown in many Mediterranean countries, as well as here in California. The Malagas, again, were originally the Muscatels grown around Malaga, in Spain; but of late this name is being, with considerable confusion, applied to a coarser raisin made in California from a grape here called, for want of a better name, the Malaga grape.

Among names which were formerly much used, but which have gone out of use, was the Solis, or sun-dried raisins, especially the sun-dried Muscatels of Malaga. As early as 1295 A. D., the Muscatels were generally called thus: Raisins of the sun; Solis, or sun-dried, so as to distinguish them from the inferior dipped, or Lexias. In our own time, this name was nearly being revived, when a couple of years ago our California *sun-dried* raisins were spoken of in opposition to our *machine-dried* raisins, and when both classes had their earnest and enthusiastic champions.

We cannot leave this chapter on names without referring to classes of raisins receiving their names from certain localities. Of course, the number of such names may be almost endless. It is, however, only of interest to refer to the principal ones, such as have been known to commerce in former days or are yet known. Thus, we designate as Malagas any of the raisins grown and shipped from Malaga. The Smyrnas (formerly Smirna) are those from Smyrna, in Asia Minor, both sun-dried and dipped raisins; the Alicantes, dipped raisins, from Alicante, in Spain; the Denias, dipped raisins from Denia, in Spain; the Valencias, dipped raisins from Valencia (include Denias); the Lipari, raisins from the Island of Lipari, near Sicily; the Belvideres, from the same island and from the Island of Pantellaria; the Calabrian raisins, from Calabria, in Italy; the Faro raisins, from the port of Faro, in Algarve, Portugal. We have above already referred to the currants, from the town of Corinth and the Grecian Islands, and the Malagas, from Malaga. The latter were also known as "great raisins," on account of their superior quality. Among the latter we should, of course, count the California raisins; but, unfortunately, our raisin-growers have not until quite recently recognized the necessity of adopting names which should at once show the locality where the raisins are produced. But we will return to this further on.

VARIOUS KINDS OF RAISINS.

a. Sun-dried raisins.

1. *Muscatels*, or Muscats, from Malaga or California. The former, also known at various periods as "Solis," or sun-dried, or "great raisins," on account of their very superior qualities.

2. *Currants*, raisins made of the small currant grape, originally from Corinth.

3. *Belvideres*, raisins from Calabria, in Italy, and from the Islands of Lipari and Pantallaria, near Sicily.

4. *Black Smyrna*, properly only a dried grape, not exported to this country.

5. California *Malagas*, made from the Malaga grape.

6. California sun-dried *Sultanas*, made from the Sultana grapes in this State. And, lastly,—

7. *Seedless Muscatels*, made in California, and being the smallest Muscats separated from the larger seed-bearing berries.

8. *Thompson Seedless*, a new, very promising raisin now being produced in this country from vines imported originally from Constantinople, producing seedless grapes, slightly larger than the Sultanas.

9. *Dried grapes* of any description, especially wine grapes, exported from this and Mediterranean countries for wine-making to France, England and the Eastern States.

b. Dipped raisins.

10. *Lexias*, or Dipped Muscatels, from Denia, Valencia, Alicante, in Spain.

11. California Dipped, especially second-crop Muscatels. Proper name not yet established.

12. Smyrnas, which again may be either *Sultanas*, *Chesmes* or *Elemes*. The first from the Sultana grape, the two latter, the "red" grapes, from Dipped Muscatels.

13. *Faros*, from Algarve, in Portugal, not known in this country.

c. Dried in the shade.

14. *Huasco* raisin, from Chile. To this list might be added many more varieties of less importance.

RAISIN DISTRICTS.

FOREIGN DISTRICTS.

RAISINS IN ANCIENT TIMES.

Previous to the production of raisins in California within the last twenty years, the raisin industry of the world was entirely confined to the Mediterranean district of Europe and Asia. At that period, however, raisin grapes became more disseminated, and raisins were produced to begin with in small quantities in widely distant countries, such as Chile, Australia and California. By virtue of their climatic conditions, the Mediterranean countries were the only parts of Europe where raisin culture could be successfully carried on, though it is almost certain that the original home of the raisin grapes must be looked for elsewhere. In searching for the original habitat for the ancient varieties of raisin grapes, we must look further east to ancient Persia, or to the tablelands of Western Asia generally. In remotest antiquity, grape culture was carried on there, and in the ancient records of travelers in those countries we find mentioned dried and seedless grapes. We can trace the origin of two varieties of raisin grapes to the beginning of our era, which must then already have attained perfection. As has been mentioned before, Pliny spoke of a small, sweet and remarkable grape grown by the Greeks, evidently the "currant;" he also mentions *Uva Zibebae* and *Uva Alexandria*.

The Latins generally spoke of Uvae Apiariae or Uvae Muscae, our present Muscatels or dried grapes generally. This carries us back fully nineteen centuries. But we may well believe, even in want of records, that the drying of grapes was practiced centuries before.

MODERN RAISIN DISTRICTS.

Leaving remote antiquity, it was only in the Mediterranean basin, and in comparatively modern times, that the drying of grapes developed to an important industry, and in more recent times yet that grapes were exported to Northern Europe. While thus the industry is old, it was not until the eleventh century, at the time of the Crusades, that it became important. The returning knights brought with them taste for and acquaintance with the products of the East. Northern Europe became the consumers of raisins, regarding them as the greatest luxuries, only to be afforded by the rich. It has been reserved for our time to make the raisin a necessity even in humbler homes. The perfection to which the raisin industry has attained is of modern origin not yet half a century old.

The raisin districts of the world are not large, and while for centuries every effort was made to extend the planting of raisin grapes and their curing into raisins, few of these efforts have been crowned with success. While raisin grapes may grow and be turned into raisins in almost every part of the Mediterranean basin, experience has demonstrated that it has only proved a paying business in comparatively few localities. The reasons of this are not fully apparent; but they are evidently dependent both upon climatic conditions and upon the capability of the natives to learn and profit by the experiences of others, and upon their enterprise in venturing upon a new industry. On the other hand, it is not likely that, even with extensive experiments and with the aid of large capital, the growing and curing of the raisin grapes could be very extensively extended. The question there as well as here is not one alone of agricultural consideration, but a financial problem dependent upon the labor supply, the facilities for shipping, climatic conditions during the curing season, etc. Such being the case, all the more interest is attached to those localities and districts where the raisin industry flourishes, and where there is every probability that it will remain a success.

THE MALAGA DISTRICT.

Extent and Age of the District.—Malaga has been known to export raisins since 1295 A. D., but must have been a raisin-producing district centuries before. The raisin cult, then, is no doubt of Phœnician origin, and has been practiced in the same locality for two thousand years or more. Under the Romans the raisin industry was continued, but appears to have deteriorated and later on to have been abandoned altogether, as the local tradition credits the Moors with having re-introduced the raisin grape into Velez Malaga. The raisin district of Malaga extends along the southern coast of Spain for a distance of sixty or seventy miles. The district is subdivided into several other districts. Thus, the subdistrict of Malaga proper occupies a plain eighteen miles long by nine miles wide, in the northeast corner of which is situated the town of Malaga.

The best part of the whole district is, however, found at Velez Malaga, situated northeast of Malaga proper. It was here the raisin grape was first planted by the Romans or Phœnicians, and it was here also the devastating phylloxera first made its appearance. The raisin vineyards extend here not over a *vega* or plain, but occupy the fertile country along the coast or the litoral towards Malaga proper.

Beyond Velez Malaga to Algaroba, the Muscatel grape is of inferior quality, and is greatly superseded by the red Muscats, principally exported to France.

Another district is *Marbella*, on the coast, and in the interior we find *Ronda* and *Albuñol*. Of the principal towns in these districts, the population of Malaga is 120,000, that of Velez Malaga 24,000, of Marbella 7,700, and of Ronda 19,000.

Climate.—The climate of Malaga is the very mildest. Frost is almost unknown, and is never heavy. The average temperature of Malaga during the winter months of November to January is 56 degrees Fahrenheit, while that of Pau in France is 41, and that of Nice 47. Malaga is well sheltered on the north and east by mountains, but is open to the south. It is the most equitable climate of Europe, although the winds are sometimes trying. The summer is very tempered. The air is, however, moist, and fog, while rare, is not entirely absent. Rain sometimes falls during the growing season of the grapes, and quite frequently during the drying season. But the fog is warm and not specially injurious to the grapes, the latter often growing within reach of the spray on the seashore.

Soil.—The soil of the Malaga vineyards varies considerably, the best being a reddish clayey loam with much sand and gravel. But we have also other varieties of soil, such as the white ash, gray alluvial soils, and the very sandy loam on the hills.

Location of the Vineyards.—In former years, the vineyards were principally located on the hillsides, only occasionally extending to the level plains. Of late, however, the hillside vineyards have suffered from the phylloxera and various other diseases, and many of them have been dug up. The lowland vineyards are now the best, although even they are, by far, not free from disease. Few of the vineyards are located on entirely level ground, there being but little such in the district. The nature of the country is rolling, with small valleys or flats. The raisin grapes grow apparently well both inland and on the coast. According to Consul Marston, about eighty per cent of the vineyards are situated on rolling land, ten per cent on lowland and ten per cent on the very coast. The vineyards on the coast are actually within reach of the spray.

The vineyards are generally small, none being over eighty acres in extent. Most contain, perhaps, from three to four acres each; while from twenty to forty acres is considered a good-sized vineyard.

Varieties of Grapes.—The principal variety used is the Gordo Blanco or Muscatel. It is identical with the grape known by us under that name, and which was imported to us from Malaga. But several types are found, although none superior to the Gordo Blanco.

Characteristics of the Raisins.—The Malaga raisins were, until lately, the finest raisins in the world, and for the present have only the California raisins to compete with. They are characterized by great sweetness, deep bluish color, great size and by good keeping qualities. The best raisins are those called Dehesas, being produced on the valley lands of the districts.

Yield of Grapes.—The yield of Malaga vineyards varies of course. The best yield eight or nine tons of grapes to the acre,—just like those of California. But there is a great difference between new and old vineyards. In many vineyards where formerly the yield was nine tons, the soil has been so exhausted by continuous croppings that to-day, even with manuring, two or three tons of grapes must be considered a high yield.

Distances of the Vines.—The older vineyards had their vines set seven feet by seven feet, but of late the vines are planted generally eight feet by four feet, thus much closer than by us in California.

Pruning.—The pruning of the vineyard is performed very much as in California. Formerly the soil had to be removed from the vines before they could be pruned; now this is not necessary except while the vines are very young. The various branches are pruned back to a few inches, with two eyes each, while the heads are elevated only a few inches above the ground.

Manuring and Fertilizing.—The Malaga vineyardist fully understands the value of manuring his vineyards, and uses for this purpose not only all fertilizers available at home, but also imports directly from distant countries. The most valued fertilizers are the Mexican and Chilean guanos or phosphates. The Mexican phosphate costs in Malaga sixty-five dollars per ton; still it is used by all the principal vineyardists, who know the value of fertilizers. In fact, concentrated fertilizers are a necessity to the Malaga vineyards; without them they could not be cropped. Even the most virgin soil is exhausted in ten years' time by constant croppings of raisin grapes; no paying crops could be expected if fertilizers were not used yearly. This fertilizing of the soil is, however, of recent origin, and fifty years ago was almost unknown.

When home manures are used, it is placed in holes dug round the roots of the vines, which, after exposure to the air for several months, are again filled up at the advent of spring, generally in March, before the vines start to bud.

Drying-floors, or Sequeros.—The raisins, when picked, are dried on so-called *sequeros*, or drying-floors, characteristic of the Malaga district. These floors are of different sizes and lengths in different vineyards, but everywhere constructed on the same general principles. Where an incline or a hill is found, the floor may simply be built on the slope, with no artificial elevation; but, where the ground is level, the structure of the *sequero* is different. The floor must always face the south, and the back is raised to give the floor the proper slope. The *sequero* thus consists of four walls, the front one of which is only a foot high, and the back wall from six to eight feet high. The side walls slope between these, generally with an angle of forty-five degrees. In length, these floors vary from forty to fifty feet, according to the different ideas of the vineyardists. The whole interior is filled with black gravel, and is tamped hard. These *sequeros* are divided in beds, fourteen feet or so wide, by tiles that are sunk, thus forming walks of several feet in width, and which also serve for leading off the rainwater. Around every little bed of this kind are small upright tiles to prevent the rainwater entering from the walks. Finally, in the center of the bed, is a long row of upright tiles, high enough to support either boards, mats, or more generally canvas, in order that they may shed the rain into the tile walks. The value of such floors is evident. Being covered with canvas, etc., every night, the heat is preserved, and every morning, when the sun rises, the grapes are yet warm. The drying on such beds has never, in fact, been interrupted. The drying-floors are also useful in case of too hot weather, when the grapes can be properly sheltered with canvas and prevented from being cooked; when finally dried, the covering, again, will serve to keep the moisture from too quickly evaporating.

Drying and Curing.—When the grapes are picked, the best vineyardists separate the bunches immediately in three different grades. Each grade is placed by itself on the gravelly drying-ground, and remains there to dry. When half dried, they are taken bunch by bunch by a workman, who picks out bad or overdried berries and rubbish, and in putting the bunch back turns it over. In ten days the grapes are generally dried, provided the weather has been favorable. Every night the canvas covering is slid down over the *sequero*, and the grapes protected from dew and cold, or rain. The drying is sometimes greatly hastened by the *Terral* or hot winds blowing from the plains of La Mancha, a wind very similar in its effect to the desert wind of Riverside and Santa Ana, in California.

Packing.—The raisins in Malaga are packed by the large growers themselves, and every such grower packs almost to a man. The generally accepted idea that a few packers living in Malaga pack all the raisins is erroneous. This is not the case.* Nearly all packers there are also growers owning their own vineyards. The raisins are all packed in 22-pound boxes or in quarters, etc., according to the demands of the trade.

The various raisin brands packed in Malaga are different according to the different markets that are to be supplied. Thus for England we have: Finest Dehesa, three crown; finest Dehesa, two crown; finest Dehesa, one crown; Dehesa; Choice layers; London layers, three crown; London layers, two crown; London layers, one crown.

For France again we have: 1 Imperiaux; 1 Royaux; Couches; Surchoix; Choix; Ordinaire; Surcouches, etc.

The loose raisins or *Brena* and the seedless or *Escombro* generally go to the continent or even to the United States. The old terms Garoon or Sun are now never used.

For American markets we have: Imperial Dehesa; Royal finest Dehesa; finest Dehesa; fine Dehesa; Dehesa; London layers, three crown; London layers, two crown; London loose, one, two and three crown.

Boxes are generally made from fir imported from Portugal, at fifteen cents each. Of late years, however, they are also received from Canada, and cost only seven cents each.

Labor.—The labor in Malaga is the most expensive in Spain, the best laborer being paid forty cents per day, while in Denia the labor is obtained for fifteen cents only; but it must be remembered that the packing of the Malaga raisins is a much more particular work than the packing of the dipped Denias.

The price paid for Malaga raisins at the packing-house is at an average of seven cents per pound for the best, or from one to two cents more than what is paid in California. The lower grades bring from two and a half cents upwards.

VALENCIA AND DENIA.

Extent of the Districts.—The Valencia raisins, or, as they are called, the Lexias or Spanish dipped raisins, are produced in the province of Valencia, situated on the east coast of Spain. The district contains three sub-districts, the southern one, the Alicante district, extending from Villa Joyosa in the north to Elche in the south. The raisins of the Alicante district are inferior to those produced in the other districts, both as regards quality and quantity. The most northerly district is the Valencia district proper, extending from Cullera in the south to Castellon in the north. North of the latter place the Muscat grape does not come to perfection, and even within this district comparatively few raisins are now produced as compared with a few years ago. But the bulk of all the raisins produced in the province are exported from Valencia city, and hence these raisins are known as Velencias, while in reality they come principally from Denia.

The bulk of the Valencia raisins come from the central district, or the Denia sub-district, comprising the land between Villa Joyosa in the south and Cullera in the north, or about thirty miles on each side of the town of Denia. Towards the interior the raisin district extends at the most nine miles, but the average is less, so that the whole district over which the Denia vineyards are spread includes only an area of 350 square miles, equal to ten townships of land, or about 224,000 acres. A large part of this land is not cultivated, and consists of mountains and waste places only suitable as watersheds. The town of Denia is the principal town of the sub-district, and has now a population of about 2,600 people. It is situated about half way between Valencia in the north and Alicante in the south, on the shore of the Mediterranean, in about the latitude of Sacramento in California, or thirty-eight degrees, fifty minutes north. Being one of the oldest towns in Spain, Denia was first founded by the Phœnicians, who here established the worship of Diana, from which word the name Denia is a corruption. The Phœnicians also introduced the grapes, and possibly also the drying of raisins; but the local tradition gives the honor of the latter industry to the Moors, who are said to have brought with them the variety of grape known as the Muscat of Alexandria. During a part of the year, Denia is the export harbor for the raisins of the district. This is only possible in the early part of the raisin season, as then only are the winds favorable,—the so-called harbor being nothing but a roadstead. Later in the season, when storms and rains set in, all the raisins are shipped to Valencia by railroad, and from there exported by steamers and sailing vessels.

---

*According to A. B. Butler.

Among other industries of the Denia district are the cultivation of onions, the manufacture of cotton goods, its sardine fisheries, etc., all giving work to the vineyard workers during a time of the year when there is nothing or but little to do in the vineyards and packing-houses.

The raisins of Denia are not all of the same quality, but vary according to the locality where grown. The whole district is dotted with small villages, all producing raisins. The principal ones of these are, besides Denia proper, Jabea, Jaraco, Jerrea, Oliva, Pedreguer, Jalon, Gandia, Ondara, Vergel, etc. Of these, Denia proper produced in 1876 over 2,500 tons of raisins, Jabea 1,700 tons, Oliva 1,600 tons, Pedreguer 1,000 tons, Retoria 900 tons, Jalon 850 tons, Ondara and Benisa 800 tons each. But, besides these, there are some twenty odd more villages or smaller raisin centers, which produce from 200 to 700 tons each, or an aggregate of 20,000 tons of raisins.

Soils and Appearance of the Districts.—The soils of the province of Valencia, where the vineyards are situated, are of various kinds, such as cretaceous and calcareous soils, containing admixtures of clay, sand and gravel. The color is often red, changing to gray where irrigation has been practiced, but much of the soil is of an ashy white color, similar to that of bottom lands generally. In many of the lower situated plains, the soils are blackish or dark gray, especially so where stable or other manures have been used for years.

Many vineyards are situated on the hillsides or on the rolling lands, where the gravelly soils produce raisins of smaller size and in less quantity, but sweeter and finer flavored. But the largest bulk of the vineyards are on comparatively level land, which can be and which is irrigated. The raisins produced on these low grounds in the moist and cool valleys are larger, but not of equal flavor and sweetness. In wet seasons, the hillsides are preferred, the valley lands then being too wet and cold. Accordingly, as the seasons are wet and cold, or dry and warm, the various localities produce raisins of different qualities, which again are valued and paid for differently. The extent of the valley or plain lands decides the extent of the raisin districts, and of late years the rolling vineyards have decreased in quantity, while those on the plains have increased, until at the present time almost all the plain lands are occupied with raisin vineyards, especially in the Denia subdistrict.

Climate.—The climate of Denia and its surroundings is rather cold and windy; damaging spring frosts, as well as early fall rains, frequently interfere with the setting of the grapes and with the harvesting of the crop; it has even happened several times that the entire crop has been seriously injured by one of these, or by both causes combined. Farther north, or in the Valencia district proper, the climate is milder, and frost is rare. Oranges are here at home, while the culture of raisin grapes becomes less every year. North of Castellon the climatic conditions are such that no raisin culture is possible.

As compared with the climate of Malaga, that of Denia is much less favorable to the raisin grape. The production of sun-dried and undipped raisins in Denia is not possible, and, although it has been attempted several times, it has seldom succeeded. The rainfall of Denia averages twelve inches per year. The rainiest months are those of November, February and April, but the heaviest rainfall at one time occurs quite frequently in the first week of September, while light showers are not uncommon in August, at that time doing much damage to the grapes or the just exposed raisins.

Irrigation.—Not only is irrigation necessary to grow the vines successfully and to produce an abundance of grapes, but the irrigation in the province of Valencia is necessary to the health and longevity of the vines. Nowhere else in Spain is the water so abundant, and no saving of the water is necessary in the majority of the districts. Through an abundance of water, the soil on the lowlands has now filled up to such an extent, that in the best vineyards the surface water is only from five to eight feet from the surface of the ground. Those vines which could not be irrigated have gradually become diseased, and the hillside vineyards are being rapidly abandoned and devoted to something else. Upon the abundance and constancy of the water depends the prosperity of the whole province, and there is hardly a more prosperous country in Spain. To show the close connection between irrigation and raisin production in Spain, it will no doubt interest many to know something of the irrigation system and the irrigation districts of the province of Valencia, than which no more important ones are found in Spain.

The district of Alicante is supplied with water from the river Monegre, and the Elche district from the river Minalapo. In the northern part of the province is the Murviado irrigation district, taking its water from the river Palencia. The Jucar irrigation district, situated immediately south of the *huerta* of Valencia, takes its water from the

Jucar river, distributing 850 cubic feet of water per second upon some 50,000 acres of land.

The Valencia irrigation district consists of 26,350 acres of land close to the town of Valencia, and is watered by the river Guadalaviar, or, as it is generally called, the Turia. The water is distributed through eight canals, each carrying from 35 to 120 cubic feet of water per second, the combined low-water discharge of all the canals being from 250 to 350 cubic feet of water per second. Of the importance of irrigation in this district, we can judge when we learn that the above 26,350 acres contain 72,000 inhabitants and sixty-two villages, or an average of 1,774 people per square mile, not including the city of Valencia itself, with a population of 120,000 people. It is also remarkable that this enormous population on a territory not as large as the arable land surrounding any one of our principal inland towns in California, is not alone due to the irrigation and care of the land, but to the minute subdivision of the land, which makes this culture and irrigation possible. It is a practical illustration of the value of the colony system as inaugurated in California, showing what we can expect of our inland plains when they become fully irrigated and the land properly subdivided.

Quality of the Raisins.—It has already been stated that the grapes grown in Denia are the Muscat of Alexandria, which were introduced there by the Moors. Farther south, in the Alicante district, other varieties are more common, but play no important part in the raisin production of the district. The Valencia raisins are inferior to those of Malaga, the want of heat requiring them to be dipped in lye before drying. This, again, gives these raisins a peculiar reddish, semi-transparent color, which unfits them for table raisins. The Valencia raisins are principally used for cooking; even the best grades of Valencias are inferior to the inferior grades of Malaga raisins. During the last season (1889) large quantities of Denia grapes were cured on the Malaga style, and with great success. Large quantities of such sun-dried Denias were sent in bulk to Malaga, and there repacked for export to the United States, the Malaga crop having so diminished that the usual demand could not be supplied. Years in which such sun-drying is possible in Denia are rare.

Planting and Care.—The Muscat cuttings are planted generally in February. The best cuttings are considered to be those taken from vines at least six years old. The cuttings are set at various distances according to the richness of the soil. The richer the soil the less room is given the vines. Thus the vines are set either five by eleven feet or five by twelve feet, or, in other words, they are set in rows eleven or twelve feet apart, with the vines five feet apart in the row. The depth of the cutting is regulated by the moisture of the surface soil, but averages eighteen inches. The vines begin to bud in the middle of March, and are from the start subject to great care and constant cultivation. The first operation after the cutting is planted is to cut off the top bud as soon as the vine starts to grow, leaving the two shoots only from the two lower buds. No more shoots are allowed to grow the first year. Next winter the smaller of these two branches is cut off completely and the remaining branch is pruned back to two eyes. In the second year the young shoots from the vine are allowed to grow to ten inches or so long, when all are cut away except two of the strongest. Next winter again these are pruned so to leave only two eyes on each, or four buds on the whole vine. In the succeeding years the branches are gradually increased in number, but always pruned back to two eyes. After the vine is five years old, it is seldom increased as to branches; it is then always pruned back to the same number of spurs. It can be said that the Denia growers pay less attention to the quality of the raisins, and prune more to attain quantity. They leave more spurs on their vines than do those in Malaga, and in this respect resemble many of our own California growers, who frequently leave from twelve to fifteen spurs on a vine. The vines in Denia are also raised higher above the ground than in Malaga, very much as we have been in the habit of pruning our own vines. At the age of three years the vines come into bearing; but no fine raisins are made until the vines are five or six years old.

Dipping and Scalding.—The dipping process is one of the greatest importance, and gives the peculiar characteristics to the Valencia or Denia raisins. As a similar process will sometime or other be more generally used in California, a more detailed description may prove interesting to California growers. We can probably not do better than to imitate them, although in mechanical appliances we will readily improve upon their methods. The dipping is always done at the drying ground or *secadero*. The larger part of the dipping apparatus, or the kettles, are placed under the ground so as to save heat and fuel. A trench eight or nine feet in length is dug to the depth of three or four feet. At one end is built a chimney protruding three or four feet above the level of the ground. In the other end of the trench is built a brick wall with an opening for feeding the fire. Some trenches are lined inside with bricks, making them more permanent and solid. On the top of this flue, and on a level with the ground, are built the kettles or boilers, containing not less than twenty gallons each. The boiler nearest the fire entrance is destined to contain a solution of lye or ashes, the one next to the chimney being for boiling water only.

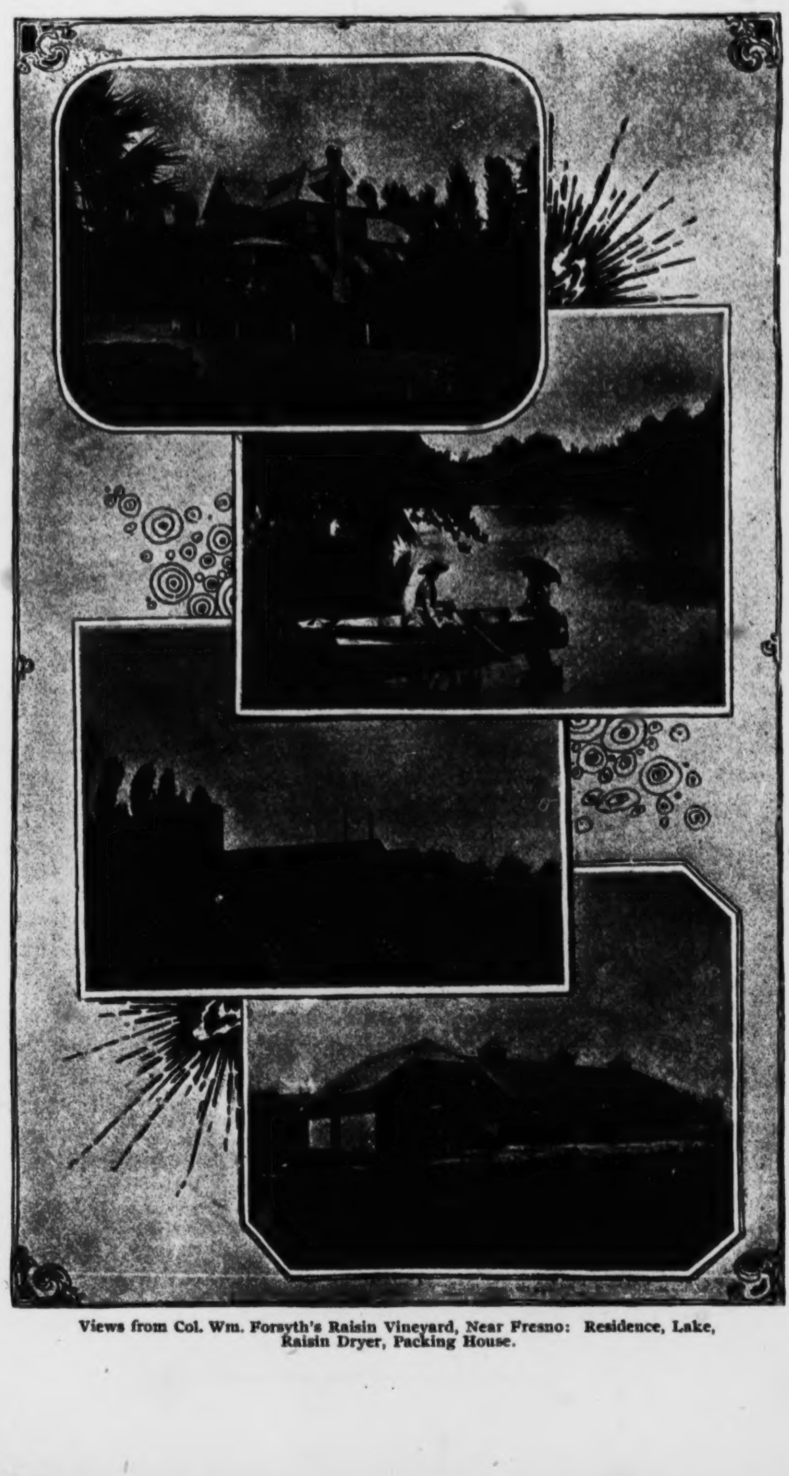
The lye is made from the ashes of burnt vine cuttings, together with lime and sometimes some salt, by men who have acquired the art from years of experience, and who know by the appearance of the scalded grapes whether the solution is too strong or too weak. If too weak, the skins of the grapes will be insufficiently cut, which will delay the drying of the grapes, and cause them to rot if the weather is damp and foggy. If, again, the lye solution is too strong, the skin will be destroyed and the berries seriously injured.

The grapes to be dipped should be perfectly ripe. If dipped before, they will become inferior both as to color and taste. The perfect ripeness is a most important point. The grapes are picked in baskets of about ten pounds each, and carried to the scalder. The man nearest him on the right fills a perforated ladle with about twenty pounds of the grapes. The ladle is made either of wire netting or of tin or zinc, with large perforated holes about three-eighths of an inch wide. There is a scalder at each boiler. The first scalder dips the grapes in the scalding water for a second, and immediately hands them to the second scalder, who dips the same ladle in the boiling lye solution for not over two seconds. The grapes are then carefully turned out on trays to dry.

The dipping first in scalding water is of the greatest importance, both in washing off the dust of the grapes and in preparing them to receive the alkali wash with more effect. Since the hot-water process was introduced, the Valencia raisins have materially improved in quality. The grapes are never rinsed in cold water after being dipped, and it is more than likely that the lye prevents molding, as, according to A. B. Butler, dipped raisins are sometimes exposed to the rain for three weeks without being totally ruined. In California, our dipped and washed raisins spoil quickly if exposed to rain. The object of dipping is, of course, to slightly crack the skins so as to allow the water to readily evaporate. Dipped raisins dry sometimes in five days, while undipped raisins would require as many weeks. Efforts to produce sun-dried raisins without dipping them have repeatedly been made in Denia; but they are invariably spoiled by the rain, and lately two firms were ruined in their attempts to dispense with the dipping process.

Drying and Curing.—After the grapes have been properly dipped, the drying proceeds very quickly. The grapes are immediately spread on cane trays or *cañezos*, about six feet long by three or four feet wide. These cane trays are made of the common Italian reed or *Arundo donax*, which grows everywhere, even in California, and is here incorrectly known as bamboo. The trays are made either of split or of entire canes tied strongly together. These trays are placed flat on the ground, only leaving enough space around each one to allow the workmen free access to the tray on all sides. After having been exposed to the sun for three days, the grapes are turned, in order to dry evenly on both sides. On the fifth day, the raisins are turned again, and, if the weather has been favorable, many of the raisins are then ready to pack. A day or two after this, all the raisins are ready, and are collected and housed. If, again, the weather has been unfavorable, the drying is very much delayed. At the approach of rain, the mats or trays are taken up and piled on the top of each other, under sheds previously made. Every drying ground has stationary appliances for this purpose. These simply consist of poles stuck in the ground, and extending five or six feet above the same. Other cross-rafters or scantlings are nailed between the poles, thus forming rows of roofless sheds eight or nine feet wide, of greater or shorter length. Painted canvas, or simply mats or empty reed trays, are used as covers, under which the raisin trays are piled. Under and between each tray are placed five little cubes of wood, for the purpose of lifting the tray and preventing it from pressing too heavily on the grapes underneath.

Packing and Disposing of the Crop.—When at last the raisins are dried, they are either stored by the producer, or, as is more generally



Views from Col. Wm. Forsyth's Raisin Vineyard, Near Fresno: Residence, Lake, Raisin Dryer, Packing House.

the case, are taken to the merchant or packer who has supplied the grower's wants during the year in anticipation of the coming crop. There are thus a number of special packers in Denia, who own large and splendid packing-houses in which the crop is yearly handled. The grower never packs himself, the enhanced value of the raisins not being sufficient to warrant the trouble. One of the best and by far the largest packing-houses in Denia is owned by J. D. Arquimbau. A more perfectly equipped establishment is not found anywhere else.

All of the packing is done by women, while the men do the carting of the raisins from the vineyards to the packing-houses. During the balance of the year, when there is no more work in the packing-houses, these very men occupy themselves with the sardine fishery, while their wives then dress the sardines and pack them in oil. They have thus work all the year round,—an absolute necessity in a country where the wages are so small, and where the poor man has no chance to save up a capital. The wages paid for packing in Denia is only fifteen cents per day; while in Malaga the same work commands from forty to sixty cents per day. In some of the warehouses in Denia, from two to three hundred women are employed, as well as a number of men. The boxes now used are halves of twenty-eight pounds, or quarters of fourteen pounds each. The large or whole boxes of fifty-six pounds each are no longer in use. The raisins are all packed "off-stalk," or, as we say, "loose." Bunch or stem raisins, or "on-stalk" raisins, are seldom seen. This great improvement in packing is of recent origin, and is due entirely to the influence of English merchants. Some thirty years ago, the raisin industry of Valencia had so deteriorated, that it threatened to entirely cease. The cause of the deterioration was principally the habit of the buyers to pay for crops, not according to the quality of the raisins, but according to the quantity. The small farmer with a few hundred pounds of raisins carefully cured was paid less, or at least not any more, than the man who had hundreds of tons carelessly cured. As a consequence, it was to no one's interest to take any particular pains in curing. The raisins deteriorated; no care was paid to packing; anything, almost, stalks, dirt and bruised berries were dumped in boxes together; brands, trade-marks and labels were unknown. The whole business was apparently going to ruin. The orders from England became less and less every year. Those from America almost ceased. The "equality price" or "average price," which has been so much in vogue in California, actually ruined the Valencia raisin industry. We ought to take a lesson from them, and change this system in time, or we will be in the same bad fix as they were.

The improvement in Valencia raisins was entirely due to the energetic efforts of English gentlemen. Mr. George Graham, agent for an English firm, established himself in Valencia, investigated the raisin business, and, seeing the true cause of the ruin, set himself to work to remedy the same. He introduced better methods in growing, curing and packing; and through his efforts a better price was paid for a better grade of raisins, and it was not long before the raisin business was on an entirely different footing.

The object of the grower was from that on, not only to increase the quantity, but to increase the quality as well. To begin with, the raisins were shipped off-stalk or loose; but the boxes were not faced. Now the raisin boxes are all faced, and the raisins are carefully selected and assorted. As a consequence, the Denia trade has of late years increased enormously, until at present all the land available has been planted to raisins. There is at present but little or no first-class raisin land left in Denia, and it looks as if the raisin production there could not be further expanded.

Export and Production.—Although the raisin industry had long existed in the province of Valencia, it was only in late years that it assumed an importance. They were already known as *Duracinae* by the Romans. Re-introduced or improved by the Arabs or Moors, it soon became a prominent industry, and the export of raisins to England was already of some consequence in the time of William and Mary. In the year 1638, Lewis Roberts, in his merchant map of commerce, informs us that Denia raisins cost eighteen rials or three shillings per hundred weight. In 1664, Gandia raisins were quite famous, and were known as Pasas. At the end of the last century, the raisins from Denia and Liria reached forty thousand quintals, or two thousand tons, distributed as follows: Spain, six thousand; France, six thousand; England, twenty-eight thousand,—equal to one million, four hundred and thirty thousand boxes, forty thousand quintals, or two thousand tons. In 1862, the raisin export from Valencia had dwindled down to seven thousand tons. In 1876, it had again risen to nineteen thousand tons, and in 1883 to forty thousand tons. Of these, nine hundred and seventy-nine thousand boxes were exported to the United States, one million, three hundred and eighty-five thousand were sent to England, and four hundred and thirty-six thousand found their way to other parts of Europe and Spain. In 1888, the yield was two million, three hundred and sixteen thousand boxes of twenty-eight pounds each, equal to thirty-two thousand, four hundred and twenty-four tons. If packed in twenty-pound boxes, this crop would have equaled three million, two hundred and forty thousand, four hundred boxes, or four times as much as California produced at the same time. The crop of 1889 is calculated to have reached two million, eight hundred thousand boxes of twenty-eight pounds each.

When we remember that this class of raisins is as yet hardly produced in California, and that the nine hundred and seventy-nine thousand boxes or more imported could and should be supplied by us, it would seem that our fears of overproduction will not immediately be realized. The tendency of the raisin market is now to supplant these Valencia dipped raisins with California undipped or sun-dried raisins, the California Sultanas being considered superior for the same purpose that Valencias were formerly used.

CORINTH AND CURRANTS.

Historical and Geographical Notes.—The principal and only raisins of any great commercial importance which are produced by Greece are the currants. We have already spoken of their name, and its supposed origin from the town of Corinth, and of their having been mentioned by Pliny in the year 75 A. D. The currants must thus very early have been of considerable importance as a commercial product, although the great increase in their production is of more recent date. The crusades which brought the nations of the North in contact with the Orient and the South also spread the knowledge of the Grecian currants to the distant parts of Europe. After the Latin conquest, currants became a commercial article, and we have every reason to suppose that, as early as the beginning of the thirteenth century, currants had reached the English shores, and that in the middle of the fourteenth century the English trade was fully established. Raysins of Corauntz were quoted in 1374 at two pence and three farthings per pound, equivalent to one dollar and twenty-five cents in our money at its present value. In 1513, the first English consul was appointed at Chios, and from that time on a direct traffic was maintained between the Grecian Islands and the North of Europe. In 1582, Hakluyt writes that efforts had been made to introduce the coren plant or vine into England, but that the same failed to fruit. The first introduction of the Zante vine into England is supposed by Anderson to have taken place in 1533. In the end of the sixteenth century, the currant traders were in full intercourse with the Venetians on the Island of Zante, and the Turks on the mainland or Morea. In 1581, the Levant Company received a monopoly in the trade of the small fruits called currants, being the raysins of Corinth. According to Wheler, who traveled in the Ionian Islands in 1675, Zante produced enough currants to charge five or six vessels, Cephalonia three or four, and Nathaligo, Missolonghi and Patros one each. Some few were also brought down from the Gulf of Lepanto.

As to the native home of the currants, opinions have considerably differed. Some have supposed Zante or Naxos to have been the original home of this grape; while others, with better reasons, have held that their original home was Corinth. Beaujour, who was French consul in Greece in 1790, says: "The fruit is not indigenous to Morea. No writer before the sixteenth century mentions it, and the result of my inquiries is that the currant came from Naxos into the Morea about 1580. It is true no such plant now exists in Naxos, but it has similarly disappeared from the territory of Corinth, though it is very certain it was cultivated there in former days, when the Venetians held the country." This account does not agree with the statements of Comte Grasset St. Sauveur, consul to the Ionian Islands from France in 1781. He states, in his History of the Ionian Islands, that "the first plants were imported from Corinth to Zante about two centuries ago," (or about 1580). There are no exact records of the time or of the introducer; but the date is fixed by the regulations of the Senate of Venice relating to custom duties. It is likely this introduction took place not much before 1553, and was caused by the hostility of the Turks, who then held Morea, to the merchant vessels of the other nations of Europe, who in fact forbade them any entrance to the Gulf of Corinth, the principal export place for the currants. Thus John Locke, who in 1553 describes Zante, speaks of other products of the island, but not of currants.

Hakluyt states that, in 1586, the chief commodities of the island were "oyle and currants." The latter, then, must have been introduced some time in the middle of the sixteenth century. Lithgow, a Scotch traveler who in 1609 visited the islands and published an account of the same in 1633, informs us that, besides oyle and wine, Zante produced one hundred and sixty thousand chickens of currants, each chicken of gold being equal to nine shillings of English money. And he adds that the custom duties on those currants amounted to twenty-two thousand piasters (one piaster is equivalent to six shillings), a sum of money which those Islanders could not have afforded (they having been, not above sixty years ago, but a base, beggarly people, and in an obscure place) if it were not that in England there are some who cannot digest bread, etc., without these currants. This seems to imply that, since the introduction of the currant culture in the Island of Zante about the year 1550, the Zanteans had suddenly become comparatively wealthy. So suddenly had this important industry spread, that in 1610, according to Sandys, the chief export of both Zante and Cephalonia was currants. In 1612, Coryat says that "Zante is famous for its wine, oile and currants." Fynes Moryson, in his "Itinerary" published in 1617, states that "the English merchant vessels exported currants from Zante and Cephalonia, and from Petrasso in the Gulfe of Corinth." Tavernier says, in 1678, that, "Corinth exports great quantities of currants. Patras does the same, which is all the trade from those two places." In 1682, Wheler states that "the ports of Patros, Nathaligo and Missolonghi, all three together having enough to lade only one good ship every year." Randolph, in 1689, mentions that currants were first planted on the plains of Corinth, and that the plain about Vostizza produced corn, currants and wine. Of Zante, he says that it produced two thousand tons of currants. Thus it will seem as if, through the fostering care of the Venetians, the currant trade was transplanted from the mainland of Morea to the Islands of Zante and Cephalonia, there to become of almost national importance. Until the Turks were expelled from Morea, the latter never made any serious efforts to recover the lost trade. First in later times the culture of currants has again spread on the mainland, especially on the northern shore of the Gulf of Corinth, and to-day the combined production of the Morean vineyards is largely in excess of that of the Ionian Islands.

In our times the currants are exported either from the mainland of Greece, the Morea, the ancient Peloponnesus, or from the Grecian Islands,—Cephalonia and Zante. In Morea, the principal ports for the exportation of the currants are Patras and Vostizza, although other ports export a few. Even the Islands of Ithaca and Santa Maura contribute a few. Efforts have been made to extend the culture of the currant vine, and introduce it to other islands, but not with any great degree of success. This is entirely attributed to climatic conditions.

Characteristics and Quality.—The currants are small, seedless raisins produced from the currant grape, which again is characterized by small clusters, which, when perfect, are very compact like the heads of Indian corn or maize. The skin of the berries is thin, the pulp very sweet, with a strong flavor and aroma. The raisins are similarly aromatic and very sweet, sometimes semi-transparent, but generally dark violet. The flavor of the raisins is entirely distinct from the Muscatel, and is very superior to that of the also seedless Sultana raisins.

Soil and Irrigation.—The soil best suited to the currant grape is a calcareous marl, which must be of good depth, loose, and easily worked. Such marls are also prized for their great power of retaining moisture. But vineyards are planted in Cephalonia, Zante and Ithaca in the most different soils and situations. They are found in gray marls, in red clay, on the plains and among the hills, in fact, in the most widely different situations. The soil of Zante contains a small percentage of sulphate of lime or gypsum, which is by many considered indispensable for the successful and profitable culture of the currant vine. The currant vine thrives especially in low and rich land which can be irrigated, and irrigation is quite essential to the perfect development of the grapes. Many vineyards, however, are not irrigated, the irrigation, of course, only being practicable on the plains. This irrigation is practiced from October to the end of December, often while the natural rainfall supplies the artificial watering. The lands are generally small freeholdings, owned by the peasants. The most valuable currant vineyards are situated on the rich and level valley lands.

Preparation of the Land for Irrigation.—The preparation of the land for a currant vineyard is expensive, as the land is hardly ever level enough to admit of the vines being immediately planted. The surface is therefore first leveled and divided up in smaller cheeks or flats, each one surrounded by a bank. The whole is covered with a network of ditches, which are necessary for the perfect irrigation of the soil. Where there is water enough, the vineyards are irrigated in November and December, and are then flooded as often as practicable, the water sometimes standing on the ground for weeks in succession. In perfectly arranged vineyards, the irrigation is so managed that the water flows from one check to another, and is first shut off at the advent of the New Year, when the pruning and cultivation begins. By this plentiful irrigation, the ground becomes thoroughly soaked, and remains saturated until the next season, when rain again sets in and fills the irrigation canals. No summer irrigation is used in old vineyards, and in young vineyards only in case of great necessity.

Distances of the Currant Vines.—The vines are set at various distances, in some places four feet each way, in others again six by ten, giving a various number of from 740 to 2,622 to the acre. In some places, the old practice of planting the vines in groups of four still exists. Each group consists of four vines one and a half feet apart, and each group distant six feet from each other either way. Of late, however, the vines are planted farther apart, probably because the soil is becoming exhausted, a favorite way being to have the vines closer one way than the other.

Care of Cuttings, Planting and Grafting.—Great importance is attached to procuring cuttings from a distance, or in getting new strains. Cuttings from the nearest vineyard are never used, as they are considered to produce inferior vines, and not do as well. To procure cuttings or vines, the old vines are sometimes cut a few inches below the surface of the soil, causing the parent plant to throw off numerous suckers or shoots, which the following winter are separated and used as we do rooted vines here in California. Three or four years will elapse before they come into regular bearing. Some vineyards are produced by grafting the black currant on the wine grape, and many wine vineyards that do not pay are thus transformed into paying raisin vineyards. The grafted vines come into bearing much sooner than those grown from cuttings. The grafting is performed in Zante as follows: The soil is dug away from the main trunk of the old vine to the depth of from twelve to eighteen inches, and the trunk cut off square at the bottom of the pit. Two or three scions are then inserted in the trunk, and made to slightly project above the ground, in no case with more than two or three eyes. Clay is then applied to the joint of the graft, and the trunk slightly covered with leaves, and the hole then filled up with soil. The grafting is done in the spring, and the cuttings must be kept dormant in dark and cool cellars.

Pruning the Vines.—The pruning is done in the fall, just as soon as the leaves have fallen, and is performed in two parts. In December, the vines are cleaned of all small, weakly or dead branches, and at that time only the large and strong branches are left. In February, the regular cutting back commences, two or three eyes being left on every spur. There are as many different ideas of pruning the vines in Greece as there are in California, each one having his favorite methods and theories as to what is proper and what is not. Some vineyardists prefer to delay the second pruning until after the vines have started to bud out, and, when the young shoots are two weeks old, the old wood is so cut that the bleeding of the vine will not run down on the bud. Bleeding is at any time considered injurious. The principal pruning is therefore conducted in February, as being the time most suitable to the currant grape and conducive to the best crops. Mr. Manoti, a very intelligent Zanteote currant grower, told Dr. Davy (*Ionion Islands*, page 343) that he had at one time experimented with pruning the currant vine at different times of the year. Those pruned in December yielded very few grapes, which were large; those pruned in April gave plenty, but very small berries. Again, those pruned in February were in every way the best. Mr. Manoti added that if he had told one of his neighbors of his experiments they would have laughed at him, and said, "Whoever thinks of pruning the uva passa (or currant) in December or April." This shows how much the growers are opposed to experimenting and improving upon the methods which have been handed down to them from their forefathers. As we have shown, the currant vines are all very closely pruned, very much in the same way as our Muscats. Seldom more than three spurs are allowed to remain, each one with two or three eyes. Summer pruning or topping the branches is never practiced on the currant vines, but generally on the wine grapes. On the contrary the currant branches are carefully guarded, and in order that they may not break are tied to stakes from four to five feet high.

Care of the Vineyard.—After irrigation is over, the vineyards are dug over. The soil is dug up around the vines and placed on top of the ground in small heaps, which process is considered beneficial both to the roots of the vines and to the soil. In April, this soil is all put back, and the ground leveled. Each vine is staked. By the middle of April, the vines are in leaf. By the middle of July, the first fruit is ripe, and by the middle of August the harvest has everywhere begun. The stakes for the vines are imported at a cost of $15 or $16 per thousand, and constitute the most expensive item in the construction of a currant vineyard.

The mildew or oidium, which some fifty years ago spread all over the world, destroyed many of the vineyards before the sulphuring was discovered as a sure remedy. Sulphuring the vines is now regularly practiced in all the vineyards; but there is a popular belief that the raisins are no longer of the same fine and pure flavor as they used to be before the advent of the oidium and the sulphur.

Ringing the Branches.—A process much used in the currant vineyards is the ringing of the branches. At the time of blossoming, some of the main branches are cut in such a way that a small ring of bark is separated from the branch near its base. The sap which ascends in the interior of the branch, but which returns by the bark, is thus prevented from returning, and must remain in the branch. The effect is that a large number of clusters are formed with berries both larger and sweeter than those not thus treated. But the practice is not without its drawbacks. In the dry lands of Cephalonia, where it was first introduced, it was soon discovered that the ringed vines began to fail after two or three years, and the method had to be modified or abandoned. In Morea, where the soil is moister and richer, the ringing did not prove as dangerous, and is yet practiced, though great care is taken that the same branch is never girdled or ringed in two successive years. Only the strongest vines are able to resist the exhausting effects of the process; the weaker ones should never be forced to overproduce.

The exhalations of fig-trees and pomegranate bushes are considered most beneficial to the currant grape, and the former are found everywhere among the plantations, especially along roads and ditches.

Drying and Curing.—The drying and curing of the currant grapes are done on drying grounds. These are simply leveled places covered with fresh cow dung, or cow dung first mixed with water into a paste. When this paste is dried, it presents a smooth surface, firm but elastic, and entirely free from smell. This kind of drying ground is considered the best kind. Inferior drying grounds are simply made of the cleared soil. The currants dried on the latter are always full of sand and dirt to an alarming extent, and bring an inferior price in the market. The bunches are turned several times until dry, when they are raked over with a wooden rake or broom, by which process the stalks are separated from the berries. The berries are now gathered, and the better qualities are winnowed in machines like our fanning-mills. The next step is to sweat the currants, which is simply done by piling them in air-tight rooms. The currants are here put in large piles, which by sweating and pressure become so hard and solid that, when removing the berries, a sharp spade is used for digging. The vintage begins in July in Zante; Cephalonia grapes ripen almost one week earlier.

Cost of Currant Vineyards in Greece.—In the Grecian Islands and Morea, the best vineyard land varies between $80 and $125 per acre for unimproved land. To prepare the land for the vineyard and irrigation, it will cost, in extreme cases, from $20 to $50 more. The first year's cultivation and care of the young vines is, of course, different according to locality, but the average is seldom less than $50 per acre. The value of already planted property or a vineyard in good bearing is seldom less than $320 per acre, and often as high as $650 per acre,—four stremmas. Strange enough, in calculating the cost of a vineyard in Greece, no one ever takes into consideration the price of the plantation or the capital invested. The interest on the same is never considered by the natives. In this respect they resemble our own farmers, who, in calculating the expenses of their farms, never take into consideration the labor of themselves and family. Of course, it is almost impossible to obtain exact calculations of profit. The following will serve as a sample: An acre of vineyard planted to currants yields 3,200 pounds. The price obtained for the same is two cents per pound, or $64. The labor for the year on one acre is estimated at $45, leaving a yearly profit of $19 per acre. In reality, however, this is not a true statement, as it does not consider the interest on the capital. If the same should be added, it is evident that there would be but little or no profit in the growing of currants. The industry simply enables the peasant who pursues the work to live and support his family, and possibly to pay his taxes. Only the very best land and the best vineyards can pay enough to enable its owner to save up a capital, generally a difficult thing in Greece for any one but a merchant or government officer.

As a rule, the cost of producing one hundred pounds of currant raisins is not less than $1.35. Whatever the merchant pays above this to the producer will be for the benefit of the producer. But, as a rule, this way of buying direct is not in use. The merchant sells on commission, and what this means we who have had experience in the raisin business in this State all know. We will see how a calculation of an acre of currants will look, when all the expenses are taken into consideration:

One acre of currants equals 3,200 pounds at three cents per pound		$96.00
Expense on 3,200 pounds at $1.35	$43 00	
Packing and hauling	7.50	
Freight, insurance, duty, etc	22.50	
Interest on capital invested	15.00	
Merchant charges say	8.00	
		$96.00

In this instance the poor currant raiser has had no other profit than the five per cent interest on his capital invested; he has, in other words, come out even. But figures, sometimes, are apt to lie. The profit, no doubt, is small to the producer, but it must still be some.

He makes, no doubt, fair wages according to his own ideas, and as he has paid for his capital in labor, and probably never handled a dollar of the same, he considers himself comparatively well-to-do. But, as currant vineyards sometimes sell, and sell high, too, it is simply unaccountable that the interest is never taken into consideration in estimating the profits of the grower. The currant industry is, I believe, the only one in the world in which this is not done. I have thus extensively dwelt upon the profits and expenses of this industry in its native country, on account of the many attempts to introduce the growing of currants here in California. The question with us is, will it pay. Our advantage is that our currants would be protected; but still it is very doubtful if currant plantations would ever pay enough to warrant us to engage in the same. The price paid at present is too low, and, as long as Muscatels bring a higher price, it will probably be the favorite grape with us.

Consumption and Production.—The importation of currants to England was, at the end of the last century, about 3,600 tons. In 1832 this had risen to 7,135 tons, in 1864 to 37,151 tons, and in 1876 to 48,595 tons. As regards the production of currants in Greece, the average yield from 1816 to 1826 was, for Cephalonia, 2,000 tons, for Zante 3,000 tons, and for Morea 4,000 tons or over. From that time on the exportations from Zante and Cephalonia increased, while the export of Morea decreased. Thus, in 1833, Zante and Cephalonia exported about 11,000 tons, and Morea only 2,000 tons, this principally on account of the Greek revolution. In 1840, the three places exported 14,206 tons, which again in 1849 had risen to 30,850 tons, in 1858 to 32,950 tons, in 1868 to 55,283 tons, and in 1876 to 86,104 tons. This large crop was exported as follows: England, 60,263 tons; Germany, 1,475 tons; Holland, 4,847 tons; Trieste, 3,241 tons; America, 11,225 tons; Belgium, 4,105 tons; Various, 948 tons.

Since that time the production of currants has increased greatly in Greece, especially on the mainland, and now it reaches yearly from 126,000 to 130,000 tons. During the last four years the production has been about as follows (according to L. C. Crowe in the *California Fruit-grower*): 1884, 130,000 tons; 1885, 114,000 tons; 1886, 126,000 tons; 1887, 127,000 tons.

In 1886 this crop was produced in the following places:

Gulf of Corinth	7,000	tons.
Vostizza	10,000	"
Patras	12,000	"
Gastuni, Pergos, Olympia	38,000	"
Kyparissia, Figliatra, Gargaliano	17,000	"
Ligudista, Pylos, Modone and Corone	9,000	"
Kalamata and Nisi	14,000	"
Missolonghi, Ætolico, Lepanto	2,500	"
Nauplia and Argos	600	"
Total for Morea and Acarnania	110,000	"
Ionian Islands, Cephalonia, Ithaca, Santa Maura	10,500	"
Zante	6,000	"
Total	126,000	"

Of this crop the United States imported as follows (the freight to New York in 1886 ranging from 17s. 6d. to 20s. per ton, gross): 1883, 13,895 tons; 1884, 10,175 tons; 1885, 8,283 tons; 1886, 8,755 tons.

In the United States, the consumption of currants has increased largely during the last twenty-five years. In 1874, we imported 14,141,797 pounds of currants; but in 1888 the importations had increased to 30,636,424 pounds, valued at $1,176,532. The duty is now one cent per pound in this country; while in England it is seven shillings per hundred pounds.

The currants exported to the United States are known as Provincial currants or American staple, and are not considered the best quality; they are grown principally in Trifylla and Pylia and are shipped from the ports Zante and Patras. Some come also from Vostizza, Catacolo, Kalamata, Nauplia and Cephalonia. The Kalamata currants are inferior and are mostly exported to France for brandy and wine making. The choicest currants are those grown in Zante, and there known as "Cascalina." They go mostly to England, while the other products of the islands go to Belgium, Holland and Northern Germany.

Currants in California.—California has so far not cut any figure as a currant-producing country, not because the currants will not grow here, but because no one has ever seriously engaged in their culture. Currant grapevines are scattered all over the State; but, to our knowledge, no plantations are larger than an acre or two. In Fresno, a few acres of currants are found in the Mirabelle Vineyard east of town, and a few hundred vines are also grown on the Raisina Vineyard in the Central Colony. Outside of these we know of only scattered vines. These currants are all of the white variety, which is considered inferior to the black currant of Zante and the mainland of Greece. When dried, they produce a most beautiful semi-transparent raisin, entirely seedless, with a very thin skin and of very fine flavor. The yield, however, has from some cause or other not been equal to expectations, and, the price of currants being lower than that of other raisins, the former has not been considered as profitable as the Muscatels. Until we import the true black currant from Zante and find the most suitable locality to grow them, it is not likely that currant culture will make much headway in this country. We have, however, no doubt that, with our various climates, many places will be found in California where the currant will yield enough to pay, provided our raisinmen will be satisfied with a reasonable profit.

SMYRNA RAISINS.

Districts in Smyrna: Their Extent and Climate.—The port of Smyrna, so famous for its dried figs, is hardly less renowned for the immense quantity of raisins and dried grapes of different kinds which are shipped from there to all parts of the world. While Smyrna figs are better known than Smyrna raisins, the latter are by far the most important industry. Thus from 1880 to 1881 the raisin crop exported from Smyrna was valued at $4,602,388; while the value of the fig crop did not exceed $1,646,998, or about three million dollars less than the former. Since that time the raisin trade has yet further increased, until it to-day reaches one hundred thousand tons of raisins and dried grapes. Unlike the figs, which are only grown in the interior valleys some thirty to sixty miles from Smyrna, the grapes which produce the raisins are grown in the immediate vicinity of the town. The large territory which exports the Smyrna raisins can, however, be divided into several sub-districts, each one having some characteristics of its own, both as regards quality of raisins, time of ripening, etc. These districts are: Chesme, Vourla, Yerly and Carabourna. The principal variety of grape grown in these districts is the Sultana, a seedless grape with enormous bunches. Many other varieties are found there also, such as "black" and "red," the latter said to be identical with the Spanish Muscat of Alexandria, which I doubt.

The Chesme district is situated to the west on the peninsula near Smyrna, its principal port for exportation of the crop being the town of Chesme. The Chesme raisins are considered inferior to those of the other districts. Three-fourths of the raisins from the district are exported to Hamburg, Bremen, Stettin, Amsterdam, and to Trieste in Austria. The latter town is the main distributing point for most of the raisins grown in the eastern Mediterranean raisin districts.

The Carabourna or Karabournou district produces the best raisins,—both of the Sultanas, the red and the black. The district is situated to the east and north on the same peninsula as Chesme. The district is rough and hilly, but the whole is cultivated to vines. The Carabourna "Elemês" go about one-half to Russia, the balance to England and Trieste.

The Vourla district consists of a fertile plain lying on the isthmus between the Bay of Smyrna and Scala Nova or Ephesus. The export place is the port of Vourla, one of the finest harbors on the coast of Asia Minor, and often the meeting place for fleets of the Western nations of Europe during their remonstrances in Turkish waters.

The Yerly district immediately surrounds the town of Smyrna, and extends from Nymphio in the east to Tourbali in the south and Sivri-Hissar in the west, thus bordering the Vourla district. Yerly Sultanas are the earliest in the market, sometimes being ready in the first weeks of August.

Small quantities of raisins also come from Tyra, Bairdir, Aidin and other places in the fig districts in the interior. The Island of Samos, off the coast of Asia Minor, produces raisins of several kinds, such as Sultanas, black raisins, principally for distilling abroad, and Muscatel raisins, the latter reaching three thousand tons in favorable seasons. The Island of Cos or Stan-chio is also famous for its Sultana raisins, said to be the finest of any produced in Turkey.

The climate of the Smyrna raisin districts is very mild, allowing farm labor to be performed the year round. The temperature seldom falls below the freezing point, while from the middle of May to the middle of September it ranges from 70 to 90 degrees Fahrenheit in the shade. During the summer, the *Imbat* or seabreeze tempers the heat and makes the climate pleasant to live in. The grapes begin to ripen about July first, the Sultana grapes being the earliest. The rainfall is abundant during the rainy months of the year, September to April, and averages twenty-five inches, varying from fifteen inches in dry seasons to thirty-three inches in very wet years. The following table of the rainfall is taken from the consular reports published in 1884:

Table showing the monthly rainfall in the city of Smyrna, in inches and hundredths of inches, during the nineteen years ending with 1882.

Compiled by W. E. Stevens, Consul at Smyrna.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly total.
1864	3.59	1.53	.58	3.75	1.59	.80	2.40	.50	3.30	3.51	6.80	1.49	29:84
1865	7.07	9.06	4.43	1.42	.23	.34	.10	......	......	1.27	2.67	.10	26.69
1866	1.40	1.78	1.79	.20	.95	.63	.13	.06	.39	.08	3.84	3.91	15.16
1867	2.63	3.14	1.16	.37	1.37	.67	......	......	......	1.54	5.76	7.08	23.72
1868	8.30	.32	11.24	.92	.83	.67	.27	.07	.52	1.30	4.92	.84	30.20
1869	3.21	.74	12.07	1.78	.19	.59	.04	......	.08	1.81	3.46	.80	24.77
1870	5.79	2.81	2.29	2.24	.07	......	......	.47	3.95	4.45	.18	6.73	28.98
1871	11.10	1.19	1.29	.66	1.09	.39	......	......	.07	1.30	7.04	4.55	28.77
1872	3.17	1.46	.50	4.18	3.09	.60	......	......	2.82	......	3.65	4.76	24.23
1873	2.41	5.64	2.08	.50	2.38	.16	......	......	......	2.50	2.92	2.62	21.21
1874	.14	5.82	1.92	.40	.15	......	......	......	.02	.30	10.31	8.99	28.05
1875	4.58	9.48	5.78	1.36	......	......	......	......	.15	2.87	4.86	3.96	33.04
1876	2.88	1.45	2.53	3.12	.42	1.76	.54	......	.08	.94	5.75	8.48	27.95
1877	3.08	2.92	4.84	1.11	3.47	.94	.11	.36	.61	4.00	6.09	5.98	33.51
1878	6.27	2.10	3.00	4.97	.29	.13	.40	.03	1.22	......	.44	8.50	27.95
1879	4.28	2.69	1.61	.35	2.36	.01	......	......	1.38	2.71	4.06	1.81	21.26
1880	1.61	.30	2.87	1.69	2.69	.18	.04	......	1.32	.60	4.09	2.49	17.88
1881	6.15	3.92	1.74	.80	1.45	......	.10	......	......	5.47	.15	4.72	24.50
1882	1.27	1.17	1.04	3.45	.66	.09	......	......	......	1.02	7.89	4.56	21.25
Average	4.15	3.03	3.30	1.75	1.22	.42	.22	.11	.84	1.88	4.47	4.34	25.73

As will be seen, most of the vineyards are situated within the reach of the seabreezes, some even being almost on the edge of the waters of the Mediterranean. The best vineyards are those which are situated inland from seven to twenty miles from the coast. The vineyard districts are all rough and hilly, except those in the Vourla district, which are on comparatively level ground. While some vineyards stretch from the seashore, others reach an elevation of four hundred feet or over. The soil varies with the districts. The best soil for the Sultanas is considered to be hippurite limestone soil, common in some districts. This white, marly soil is in places mixed with a yellow-ocher-colored loam, with sand and gravel. The abundance of the rainfall makes irrigation unnecessary, and no vines are grown with irrigation.

Care of the Vines.—While no general irrigation is needed, the young vines are watered by hand in years of exceptionally light rainfall. The vines are generally grown from rooted cuttings, which have been planted in trenches the year before. Previous to the planting of a vineyard, the soil is dug to the depth of three or four feet. If this can be done the year before planting, it is considered better, as resulting in a quicker and stronger growth of the vines.

In older vineyards, the vines are set in rows six or seven feet apart, and with three or four feet between the rows. The vines are not grown to standards, but from branching stalks from one to two and a half feet high, with an average height of one and a half feet from the ground. No stakes are used, and only occasionally is there seen a prop under heavier loaded branches.

The pruning is done in the winter, when the vines are comparatively dormant. The superfluous branches are then cut away, and the remaining ones are cut to two or three eyes each. The cultivation was, until lately, performed in the simplest way with pick and spade. The first digging is done in January, at which time also the ground is manured. This is done by digging pits and trenches in the vineyard, which are filled with goat and camel dung. These trenches remain open for a month or more, and are after that time filled in. The first digging in the soil is done in November, the second one in January and February, when, in leveling the ground, it is at the same time dug over again one foot or more. The third or last digging is performed in March, when simply the weeds are spaded under. Of late years, vineyardists from other Mediterranean districts have settled in Smyrna and brought with them better methods. Greek farmers have especially done much to improve the old ways of cultivation used by the slovenly or ignorant natives.

In May, the young shoots are pinched back after the grapes have set well and began to develop. The pinching of the ends produces a second crop, which, besides being later, also consists of smaller grapes than the first. All sterile and inferior shoots are then cut off, and this is repeated during the summer in order that the vines may not be weakened unnecessarily. The vines come into bearing in the third year, begin to pay expenses in the fourth year, and leave a profit in the fifth year after being set out. In the seventh and eighth years the vines are considered in full bearing.

The Sultana grapes begin to ripen in July. The vintage begins towards the end of July, and lasts until the middle of August. Other varieties of grapes are later, lasting from the middle of August to the end of September, their vintage seldom lasting as late as the first week of October. The first raisins are ready about August 1st, and the last Sultanas are all in by September 1st, the other varieties of raisins coming in later.

Dipping, Drying and Curing.—The curing of the grapes into raisins requires great care, and nowhere is any more skill shown than in Smyrna. Its raisins are the most beautiful of any, their splendid appearance and transparency being due to the process employed. The drying is done on drying-floors, which sometimes consist of the bare ground only, at other times of elevated beds of earth a foot or so high. When the soil is not naturally hard and suitable for drying-floors, it is first prepared by cutting off the weeds, and is then watered and packed until a smooth and hard surface is produced. This hard bed is sometimes left bare, and at other times covered with matting. In other places the grapes are dried on canvas, or on trays made of the Italian reed, or of grasses. These trays are raised on props three or four inches above the ground, and are loose so that they may be put on top of each other to exclude the sun, rain or fog, according to locality and season. Great stress is laid upon having the grapes fully ripe. Before thus exposed, the grapes are dipped in a solution of lye and oil, and upon the skill in this performance depends the beauty and value of the raisins. A potash is made from the ashes of the vine cuttings of the previous year. About one gallon of this potash solution is mixed with from twenty to twenty-five gallons of water, making a weak lye solution of a strength of from five to six degrees in Beaume's "Lyeometer." A similar strength would be obtained by dissolving one pound of pearl ash in ten gallons of water. Tubs of wood or zinc of the size of two and a half by two feet are used for dipping. To every such tub of twenty-five gallons is added from one-fourth to two gallons of olive oil. The latter quantity is used in the Karabournou district, where the finest raisins are made. When of proper strength as regards both oil and lye, the wash runs off from the bunches smoothly; when, again, the wash runs off in small globules, there is a deficiency of either oil or potash. The grapes are loaded in small baskets of twenty-five pounds each, and immersed in the wash for half a minute. They are then taken out and spread either on the ground or on trays or canvas. In the interior, where the sun is hot, the reed mats are placed on top of each other to exclude the sun. The same is also done if rain or fog is feared. After a few days of exposure, and when partially dried, the raisins are sprinkled every morning with the same lye solution, but without oil. The Sultanas are dried in from five to eight days. This dipping process is also used for the larger Muscatels, but the lye is made stronger, probably reaching the proportion of about one and a half pounds of pearl ash to five gallons of water. The carefully dipped raisins have a pure greenish amber color, and a peculiar flavor. They are worth twenty per cent more than undipped fruit.

The Sultanas of the better grades are now sold off-stalk or loose. The finest brands are the Chesme elemê, or Chesme select. Elemê means choice or select, and is used both for raisins and figs. The yield of an acre of Sultana vines varies in different vineyards, according to the quality of the soil. A good yield is considered about seven tons of fresh grapes, or about two and a third tons of raisins.

The price of the Smyrna Sultanas fluctuates considerably; but it may be said that the best grades are always from twenty-five to thirty per cent higher than the dipped raisins of Valencia. Thus, in 1843, dipped Valencias brought six and a quarter cents, while the Smyrna Sultanas brought ten cents. In 1844, the Valencias were quoted at ten cents, while the Sultanas brought twenty cents per pound. Of late years, the Smyrna Sultanas have fluctuated between four and a half and twelve and a half cents per pound.

Production and Export.—The production of Smyrna raisins and dried grapes has enormously increased during the last few years. In 1844, the average crop was only from six to eight thousand tons. In 1868, this had increased to nineteen thousand tons, and in 1871 we find the export from Smyrna to be forty-eight thousand tons. In 1881, this had grown to seventy-five thousand tons (according to the consular report of Consul-General G. H. Heap of Constantinople). Of the districts already mentioned, Chesme and Vourla produce about three times as much as Yerly and Carabourna. A somewhat varied estimate of the Smyrna raisin crop is given by Consul W. E. Stevens of Smyrna, in his report dated February 28, 1884. According to him, the raisin crop of Smyrna should amount to one million, nine hundred thousand hundred weight or ninety-five thousand tons. These two consular estimates would give Smyrna as follows: 1871, forty-eight thousand tons; 1872, thirty-one thousand tons; 1879, seventy-five thousand tons; 1881, forty-nine thousand tons; 1884, ninety-five thousand tons. This, of course, includes all kinds of raisins. As regards the Sultana raisins, the reports of the two consuls also differ. By Consul Stevens, it is estimated to be thirty-two thousand, five hundred tons, or sixty-five million pounds; while Consul Heap puts the figures at only nineteen million, four hundred thousand pounds, or only nine thousand, seven hundred tons. We have no means to verify the statements, but are inclined to think the higher figure the more correct. If it is true that the raisin yield of Smyrna to-day reaches one hundred thousand tons, it would be absurd to think that only ten per cent should be Sultanas, which is the principal raisin grape of the district. It is more probable that at least one-third of the whole crop consists of Sultanas. About eighty per cent of all the Sultana raisins go to England, ten per cent are consumed by Eastern Europe and Russia, a small part only going to the United States.

Cost of Vineyards in Smyrna.—The cost of vineyards in the Smyrna district varies just as it does elsewhere. Bearing vineyards change hands at from three hundred to four hundred and fifty dollars per acre. The yearly labor on an acre of vines, including pruning, cultivation and drying, amounts to fifty dollars an acre or more. The average yield per acre averages from about eighty-five to ninety dollars, leaving a profit of from thirty to forty dollars, equal to from about eight to ten per cent on the capital invested. I believe, however, that these figures may be modified, and that the profit on an acre of average vineyard often reaches from fifty to sixty dollars. The fact that an acre of vineyard sells for four hundred and fifty dollars indicates that it must not only give a fair but a good interest on that sum. The raisins from one acre of a Smyrna vineyard are sold for $88. The interest on the par value of an acre ($450) for one year at five per cent is $22.50. The other expenses during the year amount to $50, leaving, as net profit, $6.50. The above is a low estimate copied from English statements.

Other Varieties of Raisins.—Besides Sultanas, Smyrna produces an enormous quantity of raisins of other kinds. The demand for these has been and is constantly increasing, the most being shipped to manufacturers of wines, distilled liquors of all kinds, jellies, jams, etc. These varieties are known as Large Black and Large Red. These varieties are grown in all the Smyrna districts, and in quantity far exceed the Sultanas. The following will give an idea of how this trade has increased of late. Red and Black Smyrna raisins in tons: 1868, 12,795, 1876, 15,500; 1881, 40,000; 1883, 45,000; 1888, 60,000. The price varies from three to four cents per pound in the local market. Judging from the constantly increased export of these kinds of raisins, it is not likely that the production of the same is likely to soon be overdone.

ITALY AND ITALIAN RAISINS.

Lipari and Belvidere.—Of the Mediterranean countries, Italy produces the smallest quantity of raisins. We cannot imagine this to be on account of unsuitable soil and climate, but more on account of the tardiness of its people to take kindly to new industries and improve upon their older methods. In former years the raisins from Southern Italy were much exported to Northern Europe; to-day the trade is insignificant. In the sixteenth century, the raisins from Lipari and Belvidere were of considerable repute, but were, however, considered inferior to the Spanish raisins. The Island of Lipari, to-day principally known on account of its volcanoes, produces yet so-called Lipari currants of larger size than those from Morea. They are of much inferior quality, being hard and dry and of oblong shape.

Pantellaria.—The Island of Pantellaria, between Sicily and Africa, also produces raisins of somewhat better quality, which, if better packed, would favorably compare with the Lexias of Valencia and Denia. The Pantellarias, or Belvideres, as they are known in the market, are principally consumed in Northern Italy and Southern France. They are sweet and good raisins, which, if carefully and intelligently handled, would rapidly improve in quality.

Calabria.—Since the destruction of the Calabrian raisins through the mildew, the raisin production of this peninsula has largely increased. In 1876, it had reached eight thousand tons, but must now probably be double that amount. The Calabrian raisins produced on the mainland of Italy are of good quality, and are principally exported to France.

CHILE AND HUASCO RAISINS.

Characteristics.—The Chile or Huasco raisin is one of the finest raisins in the world, and in the opinion of the author superior to both Spanish and California raisins. They excel in sweetness and aroma as well as flavor; their skin is thin, and the seeds are small. The color is entirely different from sun-dried California or Spanish raisins, being yellowish amber with a fine and thin bluish bloom, indicating that they have been dried in the shade or in partial shade without dipping in lye or other solutions.

Location.—The number of acres devoted to raisin culture in Chile is not known. The grapes for this purpose are grown almost exclusively in the valley of the Huasco, back of the port of Huasco in the province of Atacama. There appear to be two distinct valleys of the same name, one situated only twenty minutes' ride from the port of Huasco on the Pacific Ocean, the other farther inland about sixty miles from the coast. In the former place, the culture of the raisin grape is very limited, the whole valley and town only containing four hundred people, of which not all are occupied with the raisin industry. The interior valley is more extensive, and the largest quantity of the Huasco raisins come from this place. The port of Huasco is situated in latitude twenty-seven degrees, thirty minutes south, longitude seventy-one degrees, sixteen minutes west.

Muscatel or Gordo Blanco Raisin Grape, Second Crop. Two-thirds Natural Size

Varieties.—The grape used for raisins is a variety of the Muscat, very similar to the Muscat of Alexandria. Grapevines transplanted to California resemble this variety very much, but, according to Professor Hilgard, set their fruit better, and do not suffer so much from colure. It is said that these grapes were imported to Chile long ago by the Spanish conquerors, and it is supposed they grew the vines from seed brought from Spain, and selected the best of the seedlings. In this way the slight difference of the Huasco grape from the Muscat of Alexandria can be accounted for.

Soils.—The soil in the coast valley consists of a reddish, sandy loam, which changes to a fine yellow sand, of great richness. This sand covers the hills almost everywhere in the vicinity of the Huasco river, the nature of the country being a rolling one.

Climate.—The climate is notoriously dry, and rain falls only very seldom between June and September, is of short duration and very scant. In the interior valley, rain is said to be seldom known, and the climate there can be called entirely rainless. Dew is abundant in the winter, but the summers are warm and dry.

Irrigation.—Near the coast no irrigation is required, but in the interior valley the grapes are irrigated three times a year, first when the buds begin to swell, second when they begin to blossom, and lastly when the fruit is well advanced.

The Vineyard.—The vines are planted six feet one way by eight feet the other, and the intermediate space is often planted to alfalfa, giving three crops of hay each year. The heads are kept low, the vines are pruned heavily, and only two eyes left on each cane. Sometimes whole branches are cut away, especially if they do not bear well. The vines are grown both on hillsides and in the valleys on the bottom lands. Many of the vineyards are surrounded by elevated arbors or trellises, over which the vines are trained, to keep off the heavy spring winds which otherwise would break the branches,—windbreaks, in fact. The cultivation of the Huasco vines is of the most primitive kind. The land is poorly cultivated, and the fact that alfalfa is grown between the rows of the vines indicates that the industry is not highly developed. On the other hand, it is not impossible that the crowding together of various things on the land may help to give the grapes a certain flavor or aroma.

There is said to be a great difference between the various Huasco grapes, some being very superior to others. The inferior kinds are called simply Muscats, while the better kinds are the Huascos. It is not known if these varieties come from different kinds of grapes, but it is likely that this is the case. Vines of the best variety transplanted to other localities than the Huasco valley give invariably indifferent results, and produce raisins inferior to the Huasco.

Drying and Curing.—The poorer qualities are simply dried on boards or on the roofs of the houses in the sun; but the fine and most valuable raisins are dried in the shade. When ripe, the bunches are carefully picked and taken to open sheds with thatched roofs, and there hung up to dry. The raisins are turned at intervals, and when ready are packed in twenty-five-pound boxes without any great care or skill. The best Huasco raisin sells at fifty cents per pound in the local market, and is decidedly the most high-priced raisin known. The best variety is scarce even in Chile, and in Chilean statistics I could not find any quoted. The following houses in Huasco are dealers in fruits and raisins: Juan Quijada, Ramon F. Martinez, and José Manuel Balmaceda. The export from the port of Huasco in 1885 amounted only to $685,853. How large a portion of this was raisins is not known.

CALIFORNIA RAISIN DISTRICTS.

A GENERAL REVIEW.

Early History.—While the planting of raisin grapes and the production of raisins in California dates back some thirty odd years, the raisin industry cannot be said to be as yet twenty years old. Already, in 1851, Col. Agoston Haraszthy grew Muscatel vines from seeds of Malaga raisins. On the 25th of March, 1852, he imported the Muscat of Alexandria from Malaga, and ten years later, during a visit to that place on September 27, 1861, he selected cuttings of the Gordo Blanco which afterwards were grown and propagated on his San Diego county vineyard. The same year he imported Sultana vines from Malaga, and white and red Corinth from Crimea. Col. Haraszthy was thus the first one to introduce the raisin-vines in this State. Another importation of the ovoid Muscat of Alexandria was made in 1855 by A. Delmas and planted at San José, according to a statement made by his son D. M. Delmas,* the prominent San Francisco lawyer. G. G. Briggs of Davisville also imported Muscatel grapes from Malaga in Spain; while R. B. Blowers of Woodland, Yolo county, started his raisin vineyard in 1863 from Gordo Blanco cuttings received from Col. Haraszthy. In 1876, W. S. Chapman, imported the best Muscatels from Spain for his colonists in the Central California Colony in Fresno, which proved in no way different from those already growing there. Who produced the first raisins in California will probably never be satisfactorily known. According to page 88 of the Report of the State Agricultural Society of California, 1863, cured raisins were exhibited by Dr. J. Strentzel at the State Fair in 1863.† The first successful raisin vineyards in the State were those planted by G. G. Briggs at Davisville in Solano county, and by R. B. Blowers at Woodland in Yolo county. Both these gentlemen grew the raisin grapes on a large scale, and shipped raisins extensively. The Briggs vineyard consisted mainly of Muscats of Alexandria, while the Blowers vineyard contained the Gordo Blanco. Both these vineyards produced raisins as early as 1867; but it was not until 1873 that their raisins cut any conspicuous figure in the market. That year six thousand boxes were produced in the State, the majority by far coming from these two vineyards.

Later Planting.—In 1873, in the fall, the Muscat vines were first brought to the Fresno raisin district, where twenty-five acres of Muscat of Alexandria were planted in the Eisen vineyard. A few years later, or in 1876 and 1877, T. C. White planted the Raisina Vineyard in the Central California Colony near Fresno from Gordo Blanco Muscatels brought from R. B. Blowers' vineyard at Woodland. The following year, or in 1877–78, Miss M. F. Austin began improving her Hedgerow Vineyard, also in the same colony, with grapes of the same kind as Messrs. White and Blowers. Robert Barton had also planted some twenty-five acres of Muscat grapes, but did not make raisins until later. The year 1879 saw the first planting of the A. B. Butler vineyard, now the largest vineyard in the State. J. T. Goodman had began improving his place at the same time; While Col. William Forsyth entered upon raisin-grape growing between 1881 and 1882, most of his grapes, however, being planted a year or two later. From that time the raisin vineyards in Fresno multiplied rapidly, and about 1886 and 1887 raisin production became recognized as the principal industry of the district.

---

* See also Wickson's "California Fruits," page 357. † *Same*, page 79.

The history of the development of the raisin industry in the other districts of the State runs very much the same. Riverside had entered the field in 1873, when the founder of that colony, Judge John Wesley North, planted there the first raisin-vines of the variety Muscat of Alexandria. But raisin-grape growing did not become general until 1875 and 1876, when the largest vineyards in the colony were planted. In El Cajon valley in San Diego county, the first raisin vines of the Muscat of Alexandria variety were planted in 1873 by R. G. Clark; but the raisin industry did not get a good start until some six or seven years ago, while most of the vineyards were planted from 1884 to 1886. In Orange county, raisin grapes were planted at the same time as in Riverside and El Cajon by MacPherson Bros., near Orange, now called MacPherson. The raisin industry developed rapidly, and Robert MacPherson, the largest grower and packer in the district, and at one time in the State, handled yearly over one hundred thousand boxes, while the yearly crop of the district rose to one hundred and seventy thousand boxes.

In Central California, the raisin industry is gradually spreading from the original center around Fresno, the greater freedom from rain and the better facilities for irrigation being great inducements for the settlers to engage in the growing and curing of the raisin grapes. The San Joaquin valley is expecially adapted to the production of raisins, the Fresno raisin district being by far the largest, and now producing almost one-half of the raisin crop of the State. In San Bernardino county and district, the raisins are also grown to great profit and with great facility, and are of equal quality with those of the interior of the State. But the raisin industry is here gradually giving way to the culture of oranges and other citrus fruits, and the increase in the raisin acreage has therefore not been so great as in the San Joaquin valley. In El Cajon, irrigation is not used, and the raisins produced there are very similar to the Malaga raisins, but through absence of irrigation the crops are smaller than in any of the other districts in the State. In Los Angeles and Orange county district, the raisin industry has suffered immensely from the ravages of the vine plague, an as yet entirely mysterious disease, and the output of raisins there has dwindled down to almost nothing. But the farmers of the district are ready to replant whenever there are any prospects that the vines will do well again.

In the interior of California, north of Solano and Yolo counties, large quantities of raisin grapes have been planted during the last few years, both in the foothill valleys, out on the plains, and in the bottom lands of the Sacramento, Yuba and Feather rivers, etc. Raisins of very good quality have been produced in that part of the State for years in limited quantities, but it is yet a question to what extent that section can compete with the central and southern parts of the State. In Sutter county around Yuba City the cultivation of a seedless raisin grape is advancing rapidly, the raisins made from it being of excellent quality and finding a ready market.

Acreage and Crops.—The quantity of raisin-vines planted cannot be estimated correctly; but it is certain that at least sixty-five thousand acres of Muscat vines are now set out in the State, including grapes in bearing, as well as vines lately set out.

California enjoys a climate peculiarly adapted to the culture and curing of the raisin grape. The summers are warm and rainless, the winters again moderately rainy. The interior is free from injurious fogs and heavy dews, while the most southern coast is only visited by warm fogs, which are not greatly harmful to the grapes. Irrigation is practiced almost everywhere, except in El Cajon valley, and in some of the northern districts of the State, but even there it is no doubt that judicious irrigation would be beneficial and greatly increase the crop. The demand for California raisins has kept pace with the improvements in curing and packing, and has steadily increased from year to year. What the future has in store only the future can tell, but it is almost certain that first-class raisins will always be in demand, while inferior grades may from time to time bring lower prices. The ruling price of raisins in sweatboxes, as they may be had from those growers who do not pack themselves, has been from four to five cents per pound. Of late years, the tendency is developing to pay according to quality, and from three to seven cents was the ruling price for unpacked raisins in sweatboxes during last season (1889). This practice will greatly promote the raisin industry and encourage growers to grow large grapes and fine bunches, and to cure their raisins well. It will also benefit the buyers, who will know what they pay for, and who will be able to furnish better grades, and more of the best grades than formerly, when good, bad and indifferent raisins brought five cents per pound.

The raisin crop of 1889 did not exceed one million boxes. Should we venture upon a statement as to the distribution of the same among the various counties or districts of the State, the following figures would be found as near correct as it is possible to get them:

Fresno district	475,000	twenty-pound boxes.
Tulare	15,000	" " "
Kern	4,000	" " "
Yolo and Solano	120,000	" " "
Scattering	25,000	" " "
San Bernardino	265,000	" " "
Orange and Los Angeles	8,000	" " "
San Diego	75,000	" " "
	987,000	" " "

YOLO AND SOLANO.

Location and Acreage.—The district is situated north of San Francisco Bay, bordering on it as well as on the Sacramento river, and is a part of the Sacramento valley. The number of acres overreaches seven thousand, and is increasing yearly. The principal vineyards are those of the late G. G. Briggs at Davisville, Solano county, with three hundred acres, and at Woodland in Yolo county, four hundred and sixty acres; E. Gould, also at Davisville, two hundred acres; H. M. Larou, at same place, about fifty acres; sundry vineyards around Davisville, fifty acres; around Woodland and Capay valley, some four hundred acres;—or in full bearing more than two thousand acres. The district comprises the southern part of Yolo and the northern part of Solano counties. The grape used for raisins is principally the Muscat of Alexandria, except the vineyard of R. B. Blowers, which is composed exclusively of Gordo Blanco. The Muscat of Alexandria is generally preferred, as it makes a fine raisin and bears well.

Soil and Climate.—The soil varies somewhat; the best is a deep gray, alluvial bottom-land soil; other soils are not much thought of for Muscatel raisin grapes. The average depth of water is about eighteen feet from the surface. It is not necessary, as a rule, to first level the land, as the ground is very level naturally. The rainfall averages thirteen inches. The most rain falls in January and February; the least falls in August. There is seldom a shower in the summer, but about November 1st rains are almost always certain to interfere with the drying of the grapes. Sometimes the rain comes in October, when it causes considerable damage to the grapes and partially dried raisins. There is very little dew in summer time, but plenty in October and also some in September. The temperature is considerably modified by the nearness of the bay. It reaches in the hottest part of the summer one hundred and fourteen degrees Fahrenheit in the shade, but only for a day or two. The average highest is about ninety degrees Fahrenheit in the shade, while the heat almost every day in July and August shows eighty-five degrees Fahrenheit in the shade. Thus this district is considerably cooler than the San Joaquin valley and San Bernardino county, but warmer than Los Angeles and San Diego districts. There are heavy frosts in winter, when at times even the thermometer falls to eighteen degrees Fahrenheit, although this is the extreme low temperature, six or seven degrees of frost being more common. There is spring frost in April one year in every three or four, and the vineyards are then smoked to prevent injury to the vines. Irrigation is not needed to produce crops, only to produce larger crops, as it increases the yield fifty per cent. Generally two irrigations a year are needed, the first one in early summer, the other later, when the berries have begun to ripen. Water from ditches is used and carried to the vines in furrows only, no flooding being practiced.

The Vineyard.—In planting, cuttings are used principally, but rooted vines are preferred by some. The distances most common are ten by ten feet each way, one vineyard being set ten feet by sixteen feet. The vines bear the third year. The ground is plowed and cross-plowed, the first plowing being from the vines, and the second to the vines. Harrowing and cultivating both ways are secondary operations, continued to the middle of May, but seldom later. Hoeing the vines finishes the work of the soil in the middle or end of May.

In pruning, the crowns are never raised over six inches above the ground, from seven to eight spurs are left on large vines, and each spur is pruned to two or three eyes each. Formerly more eyes, say from four to five, were left on each cane, but it was found that this was too many, hence the change to two or three eyes. Summer pruning is practiced by some, but not by all; there is yet a controversy in regard to its usefulness. When practiced, the vines are cut six or eight inches from the tops, and this is done not later than June. Sulphuring is in use everywhere; the vines are sulphured two times, once before and once after the bloom. Sulphured vines do not suffer from mildew. Colure, or the dropping of the young berries, is not common, the Muscat of Alexandria even setting well. The leaf-hopper (*Erythroneura comes*) is more common in some years than in others. They eat the leaves and cause the grapes to sunburn. Grasshoppers have never caused any damage. Grape moths are more or less common, but never troublesome. Black-knot is often seen on neglected vines, but is rare in old vineyards well cared for.

The Crop.—The grapes ripen in September, generally from the first to the tenth. The drying and curing occupies three weeks. The bunches are placed on trays made of pine two feet by three. Several growers have artificial dryers, which are needed for curing the second crop. The sweatboxes are large enough to contain seventy pounds of raisins, and are eight inches deep. In the Briggs raisin vineyard, the following brands are packed: three crown Layer Muscatels; two crown Layer Muscatels; one and two crown Loose Muscatels; Dehesas and Seedless Muscatels. The raisins are seldom sold in sweatboxes, and no fixed price is known for such raisins. Most growers pack their own raisins. The oldest raisin vineyard is that started by the late G. G. Briggs, and now owned by his widow. The most renowned vineyard was that owned by R. B. Blowers of Woodland, which has of late years been mostly replaced by other crops. Raisin land can be had for from one hundred to one hundred and fifty dollars per acre. This is vacant land of the very best quality. An average profit of fifty dollars per acre is realized, although some have made more money out of their vines. A yield of two or three tons of grapes per acre is common. As regards prices of labor, etc., the following were those most common last season: Man and team, who boards himself and animals, three dollars and twenty-five cents per day, can plow one and a half acres of vineyard well. Pruning, one man, one dollar per day, can prune three hundred vines, or three-fourths of an acre. Laborers generally board themselves. The raisins of this district were the first ones in the State or on this continent to attract attention, and they were the first which successfully competed with Spain. The crop of 1889 reached one hundred and twenty thousand boxes.

NORTHERN CALIFORNIA.

General Remarks.—The Muscatel and Sultana raisin grapes grow almost everywhere in the State, and it is therefore natural enough that the planting of raisin-vines should have increased considerably of late years, even in localites situated outside of those raisin districts mentioned, which have already made a success of the raisin industry. Below will be found a few notices from various such places which aspire to raisin fame, some of which have yet to make their reputation in this line. These notices are partly taken from the San Francisco *Chronicle*, which paper went to the trouble and expense of collecting such statistics at the beginning of the year. It must be remembered, however, that these statements are more or less approximate. As will be seen, all these localities here mentioned lie in the interior or the Sacramento valley proper, enjoying an inland climate. The climate in this valley is somewhat like that of the San Joaquin valley, of which it is an extension. Only the heat in summer is less, the rain in winter is more profuse, the showers in the spring of the year are later and those of the fall are earlier.

Placer County.—At Rocklin J. P. Whitney has two hundred and fifty acres of raisin grapes, and is the largest raisin-maker in the county. There are not over three hundred and fifty acres of Muscats devoted to raisin-making in the county, and the total output this year was about four hundred tons, most of which was shipped directly East. The first carload of Muscat raisins sent East was shipped from the Whitney vineyard about ten years ago. A large area of Muscat and other vineyards will be planted this season, but none for raisin-making.

Yuba County.—The raisin industry has received but little attention in Yuba county, although it has long been known that raisins of superior quality can be produced here. The area in raisin-vines is about three hundred acres, which will probably be increased by several hundred acres this season. Less than a hundred acres are in bearing. The raisin vineyards planted last season are chiefly at Colmena, midway between Marysville and Wheatland. The Muscatel grape is planted to some extent, but the favorite grape is the Thompson Seedless, a new variety of great promise.

Sutter County.—The raisin industry of Sutter county dates back to the year 1876, and the venture was first made by the late Dr. S. R. Chandler three miles south of this city. The area now in raisin vineyard is about six hundred acres, three-fourths of which are in bearing. The crops marketed and prices received are about as follows: Three thousand twenty-pound boxes at $1.65 per box; eight hundred sacks of one hundred pounds each, at five cents a pound; five hundred and twenty-five sacks of dried grapes of one hundred pounds each, at three cents a pound. The home consumption is extensive, but is not estimated. The county is well adapted to raisin growing and curing, and received the second prize at the late Oroville State Citrus Exposition. Muscatel and Thompson Seedless are the favorite grapes. The soil of this county is very rich and warm, and no irrigation has been practiced.

Colusa County.—In the immediate vicinity of Colusa there are about one hundred and fifty acres in bearing, and fully one hundred acres more will be set out the coming season. The crop of raisins in 1888 was very insignificant; but in 1889 the Colusa canneries packed forty tons in boxes. The prices ranged from $1.75 to $2.25 per box, according to quality. These figures refer only to the territory lying within a radius of eight miles of Colusa. Some of the finest raisin grapes in the county are grown near College City, and the entire output was at least eighty tons of raisins. Many of the people around Orland are reported as going into the business on a large scale. The ranchers in and near the foothills are also producing raisins of excellent quality. A single vineyard of fifteen hundred acres is being planted in one place in the foothills.

Butte County.—While Butte produces a fair quality of raisins, her vineyards are yet young and are just coming into bearing. The older vines are those of General Bidwell, at Chico, covering about one hundred acres, and those of Oroville and Mesilla valley, embracing about the same area. A large number of young vines have been set out during the past two years, and these number 52,200 near Oroville, 77,480 at Palermo, 67,200 at Thermalito, 20,570 at Wyandotte, 25,000 at Central House, 50,500 at Gridley, and something over 50,000 near Chico. These have nearly all been planted within the past two years, but a limited number are three years old. In the foothills are a number of small vineyards, but it is impossible to ascertain the acreage and product, though the total of each is not large. Practically the bearing vines of Butte number between 300 and 400 acres. The one and two year old vineyards embrace about 350 acres, so that a conservative estimate for the total raisin vineyards of the county, young and old, would be 700 acres. The raisins are all boxed and sold directly by the vineyardists, the local demand taking nearly the whole crop. The area to be planted this year will not exceed 250 acres.

Tehama County.—The area planted to grapes in Tehama county is over ten thousand acres. The greater part of the fruit grown is used for wine, and probably one-third for raisins. All the raisins produced here are packed in boxes, and a large portion is used in home consumption, while the remainder is shipped. Probably about ten thousand boxes in bulk and packed will cover the yield.

Shasta County.—The raisin industry of Shasta county is only in its infancy. There are 147 acres planted to raisin grapes within a radius of fifteen miles from Redding. The largest acreage of raisin grapes is in Happy valley. There are patches of grapes all through the foothills. Probably not over one thousand boxes of raisins were shipped. The planting of raisin grapes continues every year. Raisins are made by many small growers, and sold here at an average of six cents per pound.

FRESNO AND SAN JOAQUIN VALLEY.

General Remarks.—The San Joaquin valley is well adapted to raisins along its whole length almost, but especially in its central and southern parts. The farther we go south in the valley, the drier is the climate, and the less is the rainfall in the autumn of the year, both conditions favoring the curing of the grapes. The present raisin center is around Fresno City, where over twenty-five thousand acres are planted to raisin grapes, principally Muscatels; but from this locality the industry has been constantly spreading, until at present the other counties in the valley, viz., Merced, Tulare and Kern, can show a good acreage of young vines. Next after Fresno, Tulare county produces the largest quantity of raisin grapes, and produces raisins of the very highest quality. The principal raisin vineyards in that county are situated in the Mussel Slough district, on the rich bottom lands formed by the former delta of Kings river; of late, the planting of raisin grapes has extended to other parts of the county as well. In Kern county few old raisin vineyards exist, the oldest one being situated on the Livermore ranch, being a part of the Haggin and Carr tract. Several hundred new acres have been planted there this spring, especially in the Rosedale, Lerdo and Virginia Colonies, as well as on the plains near Delano. I need here hardly say that the raisins of Fresno, Tulare, Kern and Merced counties should be all classed together, as the climate in these various localities is one and the same, with only a slight and gradual change as to rainfall as we go south in the valley. If there will, in the course of time, be found some difference as regards quality in the raisins of these various localities in the San Joaquin valley, this difference will not be due to any great difference in the climate, but to the variety of soil on which the grapes are grown. The raisins are only grown on the level lands, situated from three to four hundred feet above the sea.

Extent and Location.—The Fresno district contains about thirty thousand acres, out of which about twelve thousand are in good or full bearing. Merced county has about two thousand acres, nearly all very young vines. Kern county has probably about one thousand acres, also very young vines, and some thirty acres of old vines. Tulare county has about seven thousand acres of Muscats, a large part of which is in full or good bearing. Many vineyards, large and small, are being planted in these counties this year, but enough attention is not paid to proper soil and to locality, and here, as elsewhere in the State, many of these vineyards will not turn out as the owners expect they will. In Fresno county, the old vineyards are planted principally around Fresno City, while in late years other raisin districts or sub-districts are growing into prominence around Malaga, Sanger, Selma, Fowler and Madera. The varieties used are principally the Gordo Blanco Muscatel, much mixed with the Muscat of Alexandria. There are some few acres of Sultanas and White Corinths, and of late many Malagas have been planted.

Soils and Climate.—There are several different varieties of soils in the district,—the red or chocolate-colored sandy loam principally east of the railroad, the white, ashy soil west of the railroad, and the very sandy soil, generally occurring in elevated ridges. We have also the deep, gray-colored bottom land in the river bottoms or along the rivers and creeks. The best grades of the chocolate and reddish loams, and of the river bottom soil, is considered the best for raisins. The very sandy soil and the alkali soil should not be used for raisin purposes. The climate is warm and dry during the summer, while the winters are not very rainy. From seven to ten inches of rain are an average in Fresno; south to Kern the rainfall decreases, five and a half inches being an average around Delano. Towards the northern end of the valley, the rainfall increases, and in Merced county varies between ten and twenty inches, fifteen inches being a high average. In no portion of the raisin-producing portion of the valley can raisin grapes be grown without irrigation, the natural rainfall being entirely insufficient. The lowest temperature is about eighteen degrees Fahrenheit in Fresno, generally in January, while the highest is one hundred and eighteen degrees Fahrenheit in the shade in July and August. The lowest temperature is reached once in from three to five years, and the highest quoted is similarly scarce. The high average in summer time is one hundred and ten in the shade, and for three months of the year the thermometer every day can be counted on to vary between one hundred and one hundred and ten in the shade. In the winter, twenty degrees Fahrenheit is often reached, and the end of December and January may be counted on as being cold and frosty. These figures all refer to the level plain land, where the most of the vineyards are planted, and not to the foothills or the thermal belt, nor to the high Sierra Nevada, where snow and ice are common, and where glaciers cover many of the highest mountain peaks. The most rainfall occurs from December to February, and the rain continues more or less scattering to April and May. There is only very seldom a shower in the summer, one perhaps in three years. In the mountains, the fall rains commence about the middle of August, on the plains again in October and November, sometimes even later. Dew is rare in summer time, but common from the beginning of October. Fog is rare, sometimes an unwelcome visitor in November, but never known at any other time of the year. Spring frosts are almost unknown, and occur only once in from five to eight years.

Irrigation.—Irrigation is practiced wherever raisins are grown. The water is taken from the rivers,—from Kings river in the Fresno district, and from the Merced, Kaweah and Kern rivers, etc., in the other districts. Before irrigation was begun in the Fresno districts, there were from fifty to sixty feet of dry soil before the natural water level was reached; but this has been so changed through a few years of constant irrigation, that now in places the land is subirrigated or moist to the surface, while in places even the soil requires to be drained, and no other irrigation is now needed except to allow the water to flow in the main or secondary canals, from which it seeps and keeps the soil filled with water, the moisture rising from below. The irrigation when practiced is done by flooding or by irrigating in furrows. New land must be irrigated until it becomes subirrigated; but, when once this is done, no separate irrigation becomes necessary. Many vineyards planted on subirrigated land which was once dry land have never since been irrigated.

The Vineyard.—The general distance of the vines is eight by eight or ten by ten feet, varying in different vineyards. Of late, there have been some efforts made to improve upon these distances, and to have them planted closer one way than the other, say five by ten or six by twelve feet. The vines begin to bear the second and third years, and if planted on proper soil should pay the fourth year and give an income the fifth year. Some vines have been known to pay the third year, there being much difference in this respect. Both cuttings and rooted vines are used, rooted vines having been preferred during the last few years. The ground is plowed in various ways in the winter time, according to the ideas of the owner. Cross-plowing is sometimes practiced. The general rule is to first plow one way, and then to cross-cultivate repeatedly until the soil is level and the weeds are destroyed. In wet places, the cultivation is kept up until July, but in proper places the working of the soil is finished in the early part of June.

Pruning and Other Operations.—The heads of the vines are kept low,—from six to sixteen inches above the ground. The canes are cut to two or three eyes, and the number of canes left vary from five to fifteen or more. The pruning is done between December and February. Summer pruning is practiced by some, but not by all growers, there being considerable difference of opinion as to the value of this operation. Sulphuring is practiced by all growers, some sulphuring only once, but the best vineyards are sulphured three or more times. Oidium or mildew never appears in sulphured vineyards. Some few growers sulphur with great success against the colure or dropping of the grapes. Leaf-hoppers are common, but do no great harm. Grasshoppers and grape caterpillars were troublesome one or two seasons, but have not reappeared of late. Black-knot is common in many places.

The Crop.—The grapes begin to ripen in the middle of August, or from the middle of August to the first of September, and at the latter date the first boxes of cured and packed raisins are generally heralded through the press. The first grapes dry in from seven to ten days, but the later grapes require three weeks or more. The drying continues through September, and for the second crop through October and even in November, or until the rains set in. The grapes are dried on trays two by three or three by three feet. The sweatboxes are generally two by three feet and from six to eight inches high. A large number of brands are packed, such as Imperial Clusters, Dehesas, Layers, Loose and Seedless. The common price for raisins in sweatboxes is from three and a half to six cents, five and five and a half cents being the average for good layers. Good land for raisin purposes can be had for one hundred dollars per acre, but nearer the town of Fresno is held higher. Bearing raisin vineyards have changed hands at as high as $1,000 per acre. From one hundred to two hundred and fifty boxes of raisins are realized per acre, and the profits vary from seventy-five to two hundred and fifty dollars per acre, according to location, soil, management, etc. From thirty to fifty dollars per acre is spent yearly in many vineyards. Few dipped raisins are produced. Some dipped Sultanas have brought seven cents in the San Francisco market. Last season about four hundred and seventy-five thousand boxes were produced in the Fresno district, and some twenty thousand boxes more in the other parts of the San Joaquin valley.

SAN BERNARDINO COUNTY AND RIVERSIDE.

Location and Acreage.—San Bernardino county, California, is entirely an inland county, sheltered by low and high hills from the ocean. Fogs and dew are rare, in places unknown, and the county offers unusual advantages for raisin-growing. The vineyards are widely distributed through the county in different localities or raisin centers, all of which are greatly similar as to climatic conditions, except as regards altitude. The San Bernardino vineyards are the highest elevated above the sea of any in California. Below will be found a list of the raisin centers in the county, with the number of acres and their altitude above the sea. It must be understood that each locality has a large extension as regards altitude, and varies in many instances several hundred feet; this fact being indeed a characteristic of the San Bernardino county vineyards. The raisin centers in San Bernardino county are:

Riverside,	1,500	acres.	Altitude above sea,	900	to	1,000 feet.
Redlands,	800	"	" " "	1,200	"	1,600 feet.
Highlands,	400	"	" " "			1,500 feet.
Ontario,	500	"	" " "	983	"	2,350 feet.
Cucamonga,	——	"	" " "	900	"	1,500 feet.
Etiwanda,	700	"	" " "			1,200 feet.

There are several other localities where raisin vineyards are found in smaller quantities, and it is safe to estimate the number of acres in the county at over five thousand. Nearly all these vineyards are situated on mesa lands, by which is meant the lands situated between the river bottoms and the foothills. As a consequence, the surface water is never near the top, but generally far down, and even continued irrigation would not be liable to raise it much higher, as the water will as rapidly drain off through the substrata, which generally consists of sandy soil and gravel. The land is in fact well drained, and differs in this respect from the plains of the San Joaquin valley. In Riverside, the surface water is from thirty to fifty feet down, and only in one or two vineyards situated deep down in the *arroyo* is the surface water as shallow as ten feet. These latter vineyards are never irrigated. In Redlands the surface water is at an average of thirty feet on the mesa lands. In Ontario the surface water is even deeper, and found at from seventy to eight hundred feet, and the shallowest water in the district is, according to Mr. W. E. Collins, twenty-five feet below the surface. It is the general belief in the San Bernardino district that deep water is necessary for, or at least beneficial to, raisin grapes, and that shallow surface water is conducive to all kinds of diseases. In this I cannot agree, as contrary to my own experiences and to the experiences of the Spanish growers.

Climate.—As regards temperature, there is some difference in the various districts. A true comparison between them and other districts is almost impossible, as the signal service thermometers are placed at unequal heights above the ground, and in localities with very different characteristics. It can, however, be said that the winter climate of the district is much milder during the winter than that of the plains of the San Joaquin valley, and very similar to the Orange county and the San Diego districts. In Riverside and Redlands, the thermometer seldom reaches one hundred and nine degrees Fahrenheit in the shade during the summer, and in winter seldom goes below twenty-four degrees Fahrenheit, while twenty-eight or twenty-seven degrees Fahrenheit is no unusual occurrence once every year, but is considered the extreme of the season. It may thus be seen that raisin vineyards and orange orchards may be and actually are grown side by side in every part of San Bernardino county, and this is a distinct characteristic of the district, which, however, it shares with Orange and San Diego counties. The warmest months are August and September, and October is generally fine for drying. So is November, and only twice (in 1885 and 1889) has there been any serious difficulty in drying the grapes. In two other years the crop has suffered slightly, but during the majority of seasons in the months of November there has not been any rain on the mesa lands, and it is this absence of fall rains which makes it possible for the raisin-grower to dry his crop without any other appliances than raisin-trays. Dew and fogs are very rare, and occur only very seldom during the summer months. When they do occur at this time, they are of but short duration, and last perhaps only from five to seven o'clock in the morning. In the fall of the year, in October and November, the desert wind blows warm and dry, and hastens the drying of the raisins. It may blow three or four times during the season, but has also been known to be entirely absent. The rain in the winter season is light, in Riverside twelve inches being an exceptionally wet season. From six to eight inches are the usual rainfall, while again the actual average for Riverside is six and one-fourth inches. In Ontario the rainfall in 1887 was 8.21 inches, and in 1888 9.23 inches.

Irrigation.—In Riverside grapes cannot be grown without irrigation on the mesa lands, with the exception of one or two localities in the arroyo. In the Ontario district, raisin grapes may be grown without irrigation in the center of the valley, but on the mesas, higher on the sides, they must be irrigated, and even in localities where they could be grown without artificial irrigation the same is always practiced whenever it can be obtained. Less water is, however, needed than in the San Joaquin valley, but more than would suffice in El Cajon. Through the nature of the gravelly subsoil, the raisin land cannot fill up with water. Seepage is only possible to a limited degree; summer irrigation is always required. The vines are irrigated three times a year, in April, June and August. The system of furrows is used, and a ten-inch flow is considered enough to irrigate one acre of grapes during one day and night each time. In Ontario the raisin grapes are irrigated every five weeks, not, however, while they are in bloom, as it is considered best to wait until the berries are well set. In Redlands, one irrigation after the winter rain ceases is considered enough, even on soil with thirty feet to water.

Soils.—The soil in San Bernardino county varies considerably. In Riverside and Redlands the best soil is a reddish loam, with some sand and gravel. But in Riverside we also find sandy soil of lighter color and strength, which, however, is less suited to grapes. In

Ontario the soil varies from a heavy clayey *adobe* to a lighter but very rich sandy loam of a grayish color. The very sandy soil in some river bottoms, especially around Lugonia, has, through experience, been found to be entirely unsuited to the raisin grapes.

The Vineyards.—The variety used for raisins is nearly entirely the Muscat of Alexandria, although several vineyardists call these grapes incorrectly the Gordo Blanco. I saw nowhere this variety, but I suppose some must have been imported there. In planting, cuttings have been preferred, probably because they are the cheapest, and because the value of rooted vines has not been properly understood. The vines are set, almost everywhere, eight by eight, only in a few vineyards nine by nine feet. There is, however, a growing belief that eight by ten feet or eight by twelve feet is better than the old accepted eight by eight feet. But I believe that this tendency to give the vines greater room will, in course of time, be followed by the opposite tendency to plant them closer, at least one way, and give more room the other way. The Muscat of Alexandria begins to bear in three years, and in four years will pay fifty dollars per acre. The practice of plowing is, in Riverside, to first plow towards the vines in the fall, and then, when the vegetation has begun in the spring, the soil is turned back towards the center of the space between the rows, or from the vines. Then the soil is cultivated with chisel-tooth cultivators, both crosswise and lengthwise, also similarly after every irrigation. But this practice is not entirely the same everywhere, and the different vineyardists have here as elsewhere different ideas, even in regard to the most common farm or vineyard practices. Pruning was formerly done much closer than now, but it was found that by close pruning the vines bore less. To-day from fifteen to twenty spurs are left on the strongest vines, and on every spur about two eyes. From twenty to twenty-five spurs were found to be too much; with such quantity of spurs the vines produce smaller and inferior grapes. Some vines which were pruned with twenty-five spurs last year have this year been given nine or ten spurs only, so as to enable them again to recover and grow strong, when the quantity of spurs will again be increased to fifteen. Summer pruning is used by some, but not by others. It does not, according to observation, injure the vine, but produces always a second crop, which is difficult to cure. Sulphuring the vines is practiced by some, but not by all, growers. A great many cannot see the use and value of sulphur. No one sulphurs for colure or the dropping of the grape, which is quite a common occurrence. The vines, however, never suffered from the leaf-hopper nor the grape caterpillars, but sunscald is not uncommon, nor is black-knot.

The Crop.—The Muscat grapes begin to ripen in Riverside later than in the San Joaquin valley, and picking commences between the 10th and the 30th of September. Highlands is said to be two weeks later than Riverside. The first crop is ready to turn in two weeks, and is ready for the sweatbox in three weeks' time. For drying, trays are used, and about twenty pounds are placed on each tray. These trays are all made of pine or fir. Redwood has been found unsuitable, as imparting both a color and a taste to the raisins if accidentally wet by early showers in the fall. Size of trays, two by three feet, with a cleat nailed at the short ends, but none at the long ends of the trays. Sweatboxes receive the raisins when they leave the trays. Formerly the sweatboxes were much larger and deeper than now, eight or even twelve inches in depth not being unknown. Of late sweatboxes are made two by three feet, or of the exact size of the trays, and not over six inches in depth. A greater depth makes the boxes too heavy to handle, and also causes the bunches to break. The packing of the raisins in Riverside and in the Southern California raisin districts generally is done by the method known as "top up." That is, the first raisins are placed in the bottom of the box and successive layers are placed on top, until finally the top layer is put on the last. The lever press for the compression of the layers is a Riverside invention. A modification of this press is now in use in nearly all districts where the "top-up" method of packing is practiced. The brands packed are as follows: Three Crown London Layers, Two Crown London Layers, Three Crown Loose Muscatels, Two Crown Loose Muscatels, and Muscatels in sixty-pound sacks; also Seedless Muscatels in sacks of sixty and thirty pounds respectively. Cotton sacks are commonly used for the two latter brands. The brands are apt to vary from year to year, according to the fancy or ideas of the packers, new ones of which are in the field every year. Only those who both produce and pack have anything like established brands. The prices paid for raisins in sweatboxes have varied in different years. In 1887 and 1888, the price was from four and one-half to five cents per pound. In 1889, the price rose to five and five and three-fourths cents, and in one or two instances six cents were paid.

The Profits and Other Items.—The profit varies, of course, greatly, but an average profit may be considered to be from about $125 to $150 per acre. The yield of an acre is variable, but from eight to ten tons of fresh grapes is said not to have been uncommon. In some cases the yield has been much higher and the profit larger. I have from trustworthy source the statement that one vineyardist who owns only a few acres, I believe only five, and who has given all his time and attention to these vines, has realized as much as $430 per acre. This I quote only as an instance of what might be done with care and expense in an exceptionally favored locality. Some few growers have realized $250 profit on each of a few acres, which also is to be considered exceptional. I believe my former statement of $150 per acre as being reliable and attainable by all San Bernardino county raisin-growers who have good land, and who give their vines sufficient care. As another instance of a high yield, I copy below an account of the vintage of C. Newton Ross of Etiwanda, San Bernardino county, California. The article appeared in the *Press and Horticulturist* of Riverside, September 27th, and I have every reason to consider it trustworthy. The writer adds that the yield is extraordinary. "Mr. Ross has seventeen acres of 8,000 vines five years old from which he picked 8,648 trays of grapes that average twenty-five pounds to the tray, or a total of 108 tons of grapes, which will make thirty-six tons of raisins,—equal to 3,600 boxes,—over 200 boxes to the acre. This is the first picking only, and it is estimated that the second crop will be half as large as the first, which will give a total yield of 318 boxes to the acre. Mr. Ross has sold his first crop at five and one-half cents per pound in the sweatbox, which will give him an income of $242 an acre on the first crop, and half as much more on the second crop if he succeeds in saving it in good shape, or a total income of $363 per acre on his crop. Mr. Ross estimates that $50 an acre will cover the entire cost of taking care of the vineyard and putting the crop in the sweat-box, and this would leave him a net income of $313 an acre for his vineyard, which is ten per cent on $3,130 per acre." But, I may add, it is not likely that such a profit can be realized year after year.

As regards care of the vineyard and expenses of running the same, they vary, of course, and are estimated at from twenty dollars upwards. But the best vineyardists spend from thirty to forty dollars per acre in the care of an acre, but in this do not include interest, trays bought, etc., nothing in fact but "care."

Vines were first planted in Riverside by Judge John Wesley North in 1873. Vacant land that is suitable for raisins may be had with water for $250 per acre. Some land with choice locations is held at higher prices. The highest yield of raisins in San Bernardino has been 290,000 boxes in 1888. Of this Riverside produced 150,000 boxes, Etiwanda 30,000 boxes, and Ontario 15,000 boxes. The raisin shipments from Riverside during the fall of 1889, up to December 12th, amounted, according to the *Daily Press*, to 216,000 boxes. There was a balance on hand of 7,000 boxes, making the total production 223,000 boxes. It is estimated that the value of this crop was $3,500,000 at wholesale. Later advices give to the county 265,000 boxes as last season's crop. The San Bernardino raisins are superior both as regards quality and size, and raisin growing and curing is a profitable business, eminently suited to the settler with small means, who cannot invest large capital, nor can afford to wait long for a return. No dipped or sulphured raisins have ever been produced in the district, although dipped raisins would prove profitable. Especially does this refer to the second crop, which ripens enough to make good raisins, but which cannot be cured when the early rains set in.

ORANGE COUNTY AND SANTA ANA.

General Remarks.—On account of the vine disease which has been injuring the Orange county raisin and wine vineyards, this district has a special interest to every one engaged in grape-growing. While the country has received a hard blow through the injury and destruction of so many of its vineyards, still it is likely that it will recover and rise as soon as the vine disease leaves.

Location.—The Orange county raisin district lies close to the sea. Of all raisin districts, it is nearest the ocean, the average distance of the raisin vineyards from the latter being eight to twelve miles, some few perhaps a little more. As will be seen, the district resembles in this respect some of the Mediterranean districts, such as Malaga and Smyrna, where the vineyards come within actual reach of the sea fogs. On one side of the Orange county district we have the ocean,

A Raisin-grower's Residence at Fresno

on the opposite side it is bordered by rather high foothills, beyond which are the San Bernardino county vineyards, some forty to sixty miles away.

Climate.—The nearness to the ocean modifies the climate much. The temperature is more even all the year round than anywhere else on the coast where raisins are grown. The extreme of heat is 105 degrees; in fact, July 27, 1889, it was 104 degrees Fahrenheit in the shade, while in the winter it seldom goes lower than 28 degrees Fahrenheit, and indeed very, very rarely as low as that. In many places there is no frost at all, except, perhaps, one in April, which, of course, cannot but prove damaging to the vines. This absence of heavy frost, which is beneficial to every other semi-tropical product, is not favorable to the vine. The grape requires heavy frost to become dormant. The farther south we go the less frost and the less grapes, at least of the Asiatic kind. There are, as we know, native grapes even in tropical countries, but they are adapted to their surroundings and cannot be considered here. The proximity to the coast modifies the air considerably. With 100 degrees Fahrenheit in the shade, which is an exception here, I felt as warm as I do in the San Joaquin valley with the mercury at 114;—the two extremes in both places affect us just the same. The air here is certainly much more moist, which again must have a marked effect upon the vine, and in no small degree promote fungoid growths, or parasites generally. In this respect, then, the coast vineyard must certainly be at a disadvantage. The fog is not an unusual visitor in the district between the coast and the foothills, which, in fact, covers the whole area ever planted in raisin grapes. For days in succession every morning is foggy, and the fog condenses on the leaves of the trees and falls under them in real showers, making the adjoining and underlying road wet. For a few days again the sun will rise bright, again to be followed by foggy mornings. By from nine to eleven o'clock the fog is again gone and the sun shines brightly. Every evening and morning there is a heavy dew, and every branch, leaf or grass is then dripping wet. Several mornings when the fog was in I found the thermometer at 62 degrees Fahrenheit, while at noon it rose to over 100.

Soils and Ripening.—The soil here is the very best, and I doubt if the same fine quality of soil is found anywhere else in California over the same extended territory. I ride for miles and miles, everywhere the finest and richest loam of a gray color, sometimes a little drawing towards slate blue, sometimes again towards yellowish. It is immensely rich, and can hardly be improved. There is, however, especially near Orange, a different kind of soil consisting of the sand loam, but intermixed with very coarse gravel. This soil is warmer but consequently not so rich. The grapes ripen on it two weeks earlier, but yield only one-half as much as those on the richest loam along the creeks. The vines planted here were alone the Muscat of Alexandria. Strangely enough I find no traces of Sultanas or currant, which latter, it seems, should be especially adapted to the coast climate.

The Vineyards.—In planting a vineyard, rooted vines were seldom used. Cuttings grew so readily and so well that they were much preferred. I am told that five per cent loss was unusual. It must be remarked that the moister is the air the better it is for any kind of cuttings. The moisture sustains and nourishes the wood while it is making roots. As to distances, I remarked nothing new. Eight by eight or eight by ten feet seems the generally adopted way. The nature of the soil and climate make higher cultivation a necessity. McPherson Bros., who packed the largest quantity of raisins and owned the finest vineyards, told me that they plowed and cross-plowed and cultivated from fourteen to sixteen times every season; in fact they never ceased working the ground. The pruning was begun in December, or as soon as the leaves began to turn and fall. To begin with, only a few spurs were left on every vine, and on every spur three eyes, including the bottom eyes, but experience taught that that way was not the very best. Gradually more space was given the vines, and now from fifteen to twenty spurs to a vine in full bearing is considered proper. Summer pruning is only practiced in some of the vineyards where the ground is quite wet. The most profitable vineyards were irrigated. The nearer the coast the more moisture there is in the soil. Thus three miles west of Santa Ana the ground is always moist enough to grow grapes, but as we come nearer the foothills to the east, the moisture is farther down. At Tustin, Orange, and especially at McPherson, irrigation was practiced in all first-class vineyards. Some were irrigated in the winter only, and this was considered the best; others again were irrigated also once in summer,—a practice the best vineyardmen considered unnecessary and even injurious. I found land near the town of Santa Ana moist one inch below the surface, where no irrigation had even been practiced. Sulphuring was used everywhere to counteract the oidium. For this purpose powdered sulphur was dusted through the vines as soon as the grapes were as large as small shot. From three to four sulphurings were used every year with a week between each. Sulphuring for the colure or dropping of grapes was not known; in fact I am informed that this colure was seldom known. Besides mildew, there are few enemies to the vine here. Grasshoppers, leaf-hoppers and grape moths have never been known to molest the vines. When the late vine-plague struck the country the vineyardists were entirely unused to fight any enemy of the vines besides the oidium. Sunscald of the berries was not known.

The Crop and its Curing.—The grapes begin to ripen in the end of August, say about the twenty-fifth, on the gravelly soil, but on the cooler and richer bottom land very much later, or about the middle of September. The harvest then begins; the grapes are picked on trays two and a half by three feet and placed to dry in the sun; the drying takes two or three weeks or more, and is accomplished with some difficulty. Two years the grapes had to be carried out to the Mojave desert, to be dried there. The trays are placed among the vines in such a way that the trays from three rows are placed in one. To protect them from the fog and dew, they are covered with canvas. This is done in two ways. One way is to put small pegs on one side of the trays. The long canvas is furnished at intervals with rings, which are slipped over the pegs and thus held steady on one side. In the daytime the other end of the canvas is simply thrown back over the pegs; in the night-time the canvas is again turned over the trays, resting directly on the grapes. The other and better way is to run three wires along the row of trays, one on each side of the trays. The canvas is furnished with rings on each long side, which are made to run on the wire. The center wire is run a little higher up, and here and there simply supported by posts. It takes comparatively little time every evening to run the canvas along the wires and cover the trays. The expense is considerable, both in furnishing and preparing the canvas, and in maintaining and operating it. The peculiar climatic conditions of the district, however, necessitate some such contrivance for the drying of the grapes. The vines seldom bear a second crop of any importance. Sometimes in October the district is visited by a warm and dry desert wind called the Santa Ana wind. It comes from the cañon of the Santa Ana river, and originates, no doubt, in the Mojave desert, and rising high up in the air is again precipitated over the hills on the lowlands towards the ocean. This Santa Ana wind is always welcome. It hastens the drying of the grapes just as the *Terral* or land winds from the plains of La Mancha hasten the drying of the grapes of Malaga in Spain.

Yield and Profits.—The yield is quite small on the gravelly soil, at the most being three tons of green grapes to the acre, on richer land frow six to seven tons, and in rare instances ten tons to the acre. I heard of one vineyard where the owner had sold from twenty acres of Muscatels thirty-three tons of raisins and fifty-six tons of green grapes, equal to about 155 tons from the lot. Another lot of three-year Muscatels bore ten tons to the acre,—indeed a very unusual yield anywhere for Muscatels. I hear reports of some wonderful yields and high profits, but am informed by the most experienced and trustworthy that $125 per acre is an average profit which can be relied upon year after year. The first Muscat vines were planted near Orange, now the station of McPherson, about 1873, by McPherson Bros. The acreage in grapevines in the Orange county district was about 8,000 acres; but probably over half of it is wine grapes. The highest output of raisins was 170,000 boxes of twenty-pounds each.

SAN DIEGO AND EL CAJON.

Location and Acreage.—The El Cajon and Sweetwater valleys are the rasin centers of San Diego county. The former contains about four thousand acres of Muscat vines, the latter about five hundred acres. Magnificent-looking Muscat grapes are also grown within three miles of San Diego. Escondido is by many pronounced superior for raisin grapes to any of the other places; but El Cajon is the present center of the raisin industry, and is likely to remain so for years. The raisin-growing section of the two valleys lies from about fifteen to seventeen miles from the coast line, and at an altitude of from 450 to 500 feet. The arable land in El Cajon valley contains 50,000 acres, or perhaps less, and consists of the rolling bottom of the valley, but which can in no way be classed as bottom land. The land partakes more of the characteristics of mesa or upland, and extends on all sides, slightly undulating upon the sides of the hills. Lower hills and behind them, again, higher hills surround the valley, and the high peaks beyond the Cuyamaca Mountains reach 4,500 feet or more. None of these hills or mountains in sight are covered with timber of any kind, and even the valleys are without the usual sycamores. Only in the very narrow bottom of the creek is there a vegetation of willows and shrubbery.

Climate and Rainfall.—The rainfall of the valley varies considerably. It has been known to be as little as six inches and as much as twenty, the average probably being about twelve inches, distributed as generally elsewhere in California,—during the winter months. In summer time it seldom rains,—perhaps a shower in two or three years. September is the warmest month, or at least the month with the greatest number of warm days. The highest temperature reached in the shade in El Cajon is 105 degrees Fahrenheit, and in Sweetwater valley 108, and the coldest in the winter twenty-four degrees Fahrenheit on the upper mesa land, while on the lower land, close to the river, the temperature falls low enough to kill orange trees, probably somewhere about eighteen degrees Fahrenheit. September is freer from fog than any other month. During the other summer months there is fog in the morning two days out of three. The fog, however, is warm and pleasant to all but consumptives, but, nevertheless, leaves behind a soaking dew on all vegetation, and is even heavy enough to moisten the dust on the roads. The moisture on this mesa land—by which is meant all the land between the hills, which are too steep to be plowed, and the actual river bottom lands—is near the surface. In the El Cajon and Sweetwater valleys, the water is found on this mesa at from eight to twenty feet, or at an average of from twelve to fifteen feet. On little hills or knobs in the valley the water is found at about the same depth. It is strange that with the water so near the surface no perennial vegetation of either shrubbery or trees should be found on this land. The grapevines will grow on it without irrigation; in fact none is used anywhere now, but no doubt it would prove profitable to irrigate somewhat, so as to increase the crops of grapes. Water can be had through the Cuyamaca flume, but has so far not been used. The vines do not grow after August 1st, and may stop growing sooner.

Soils.—The soils of the district are of four kinds: First, reddish clay mixed with gravel, the color changing between light chocolate and deep reddish. This soil is considered by many the most desirable. Second, a steel or slate gray adobe with much gravel of a coarse nature. Third, black adobe with little gravel. Fourth, alluvial sandy soil, apparently consisting of decomposed granite mixed with much vegetable matter. This soil is coarse, of a dark steel-gray color, very easily worked; it is considered the best for raisins, but it contains streaks where they will not grow and prove profitable. The last-named soil goes gradually over into common alluvial soil of a sandy nature. The two last-named soils are found principally in the Sweetwater valley.

The Vines and the Vineyard.—In planting, cuttings are generally used, not because they are most preferred, but because good rooted vines cannot be obtained. The distance to, and the difficulty of reaching, this district was formerly such that roots would suffer in transit and would rapidly dry, while cuttings could be had handy and fresh. The vines, originally planted eight by eight feet, have been given more distance of late, some vineyardists planting them eight by twelve feet, while others prefer twelve by twelve or ten by twelve feet. The varieties used are the Muscat of Alexandria only. This variety happened to be the one that was imported first from Riverside, I believe, and it was afterwards propagated by every one. The variety as grown in El Cajon is the type of Muscat of Alexandria with oblong berries, large clusters with loosely hanging berries and large strong stems. The shape of the vines is erect, with a few center shoots, strong and upright. The vines commence bearing the second year, and are said to pay expenses of caring for in the third year, but I think it would be safer to say in the fourth year.

As regards cultivation and plowing, many plow both ways and harrow and cultivate crosswise several times until the 1st of June, when, on account of the dryness of the soil, no more weeds start and no cultivation of any kind is needed. The large majority of the vineyards are splendidly kept, not a weed being seen anywhere for miles around. Winter pruning commences as soon as the leaves fall. In former years from five to nine spurs were left in pruning and two or three eyes on each spur, but it has been found profitable and judicious to leave more spurs, so as to take the sap in the spring, and now from twelve to fifteen spurs with two or three eyes each are left every winter. Spring or summer pruning has only been practiced the last two seasons, and being found very profitable is now adopted by everybody. The vines are not pinched, but headed well back as soon as the grapes are well set. This method has in this district the following advantages: It gives better shade to the bunches on account of the production of a strong second growth; it causes the bunches to fill better, and, finally, it leaves more room between the rows of the vines. I was told that any of these three advantages would warrant the system of summer pruning to be generally adopted. The valley has been unusually free from any insect pest, such as leaf-hoppers *(Erythroneura comes)* caterpillars, grasshoppers, etc., but suffers from mildew, not, however, to the extent that the presence of almost daily fogs would lead us to suppose. Sulphuring is now practiced to some extent, but not as much as it should be. The sulphur is applied with bellows as soon as the berries are the size of shot, but not before. Sulphuring for colure, or the dropping of the grapes when very small, is not practiced, nor was it ever suspected that it would help. Colure is quite common, much more so on sandy soil. Sunscald is frequent but not bad. I saw quite a number of grapes scalded on every vine, but not enough to warrant any special measures to be taken as a protection. The grapes have during this and last year ripened by the first days of September, but it is generally much later, or at about the 10th of September, when the vintage usually commences. The picking was, until last year, done by white labor, but the same was so very difficult to obtain that Chinese were then employed. They gave satisfaction to some, while to others not. Some of the principal growers are this year (1889) going to employ Chinese help at $1.25 per day, at which price they board themselves.

The Crop.—The grapes are dried on redwood trays made of sawed redwood shingles, three-eighths of an inch thick. The trays are made two by three feet. The best growers are this year going to assort the grapes when putting them on the trays. This was never done before, but will be of great advantage. A tray will average eighteen pounds of fresh grapes, which will take about one month to dry,—never less than three weeks. There is but little second crop, generally none that can be saved. September is the warmest month, or else the grapes could not be dried. At a temperature of 103 degrees Fahrenheit, it was found that grapes scalded or cooked while on the trays. This is, however, very rarely the case. From ninety-five to one hundred degrees is considered the best temperature at which the best raisins are made. The sweatboxes used formerly were two by three feet and ten inches deep; but of late eight inches and six inches in depth is considered the best, on account of the facility with which they can be handled. As to packing, many advocate twenty-pound boxes, that are only four and one-half inches deep, contending that they will hold twenty pounds of loose raisins. Few Dehesas are put up, the general brands being three crown London layers, and three crown loose Muscats. Some are also put up in fancy paper boxes. This year the valley has two packing companies, who buy raisins in sweatboxes, and pay from four to five and a half cents per pound. The yield per acre is from two to three tons of green grapes, I should say this year nearer two than three tons. I saw, however, some that would average five tons per acre, but this land was favorably situated in a moister place than is generally found in Sweetwater valley, and the vines were yet growing on August 21st. I heard of much greater yields, so extraordinary indeed that they are not likely to return again. From five to seven tons to the acre is a really rare yield, even on the best land, where the water is within six or seven feet of the surface. This shows me conclusively that judicious irrigation would materially increase the crop, and greatly improve the uniform size of the berries. The profit on an acre of bearing Muscat vines is from fifty to one hundred and twenty-five dollars per acre. The latter is the most any one realized, and thirty-five dollars is considered a good profit. The expense of running a vineyard is hard to ascertain, but those best informed told me that forty dollars per acre would be an average; this of course includes everything. The small amount of weeds and the absence of irrigation materially lessens the expenses of the El Cajon vineyards.

Good vineyard or raisin land can be had for seventy-five dollars per acre. No vineyards in bearing have changed hands. Last year's (1888) pack of the whole of San Diego county was variously estimated at from twenty to thirty thousand boxes, and this year at sixty thousand boxes of twenty pounds each.

The unanimous verdict of the best growers in El Cajon is that want of moisture is the greatest drawback to raisin culture there. And I agree with them in this, but also think it might to some extent be remedied, as water for irrigation is close at hand. At last I must say a few words as to the quality of the El Cajon and Sweetwater valley raisins. They are very sweet, highly flavored, the skin is thin, and the seeds are small and few. But while some of the berries are of very large size, there are comparatively few which would be considered large, and even the best bunches have too many small berries. The grapes that had plenty of water were simply magnificent, and a general irrigation system would greatly improve the size of the grapes, as well as the quality of the crop. The best selected raisins from this valley must be counted as among the very best. The constant fog injures the bloom on the raisins to some extent, and most raisins that I saw were in this respect deficient; but their color generally was very good. The Sweetwater valley raisins are in this respect finer than those of El Cajon; they are also farther inland, and have less fog. The Escondido raisins are said to be superior, but I saw none of them. While many vines have been planted in this locality of late, only one or two small vineyards are in bearing.

OTHER RAISIN DISTRICTS.

Of late raisin grapes have been planted in considerable quantities in Salt river valley and in Gila river valley in Arizona, but the outcome of the venture is yet unknown, at least to us. The growers of Arizona claim for their localities the advantage of great earliness, as the grapes ripen there in July, or a month earlier than in California.

In the Argentine Republic in South America it is said that the Spanish immigrants have planted many raisin grapes during the last few years. In Australia we are also informed that dipped raisins, and perhaps even sun-dried ones, have been produced, but even there the result is unknown to us. So far these raisins have cut no figure in the general market, but it is not improbable that many localities in those vast countries will be found where Muscat grapes can be profitably grown and cured.

CLIMATIC CONDITIONS, SOILS, LOCATION AND IRRIGATION.

CLIMATIC CONDITIONS FAVORABLE AND UNFAVORABLE TO THE RAISIN INDUSTRY.

Limits of the Raisin Districts.—It is an interesting fact, and by no means a coincidence, that the raisin districts of the world are found on or between the same latitudes. Thus we find the California districts between latitudes 32°, 75′ and 38°, 75′. The latitude of Smyrna is 38°, 28′, 7″, that of Malaga in Spain 36°, 75′, Valencia 39°, 25′, Denia 38°, 50′, the Grecian Islands and Morea 37° and 38°, and finally Huasco in Chile 28° south latitude. That the latter place is situated so much farther south or so much nearer the equator cannot exactly be considered exceptional, as it conforms with the general characteristics of the Southern hemispheres as compared with those on the northern half of the globe. In Europe the Muscat grape for raisin purposes is not a success north of the fortieth degree of latitude. While the limits in California and Chile are not yet fully ascertained, it may be presumed that, as far as regards this country, these limits will not differ very much from those of Spain and Asia Minor. Only years if not centuries of experience will finally decide where and where not raisin grapes can be grown and cured to perfection. While the vines and the grapes can be grown in many places, the proper curing of the raisins is attended with more or less difficulty in the various districts. With proper modes of curing the grapes, and by protecting them from the inclemencies of the weather, the limits of the successful raisin districts may be extended considerably both north and south.

Dry Seasons, Spring and Fall Rains.—The climate of the Mediterranean basin, as well as of the raisin districts of the New World, present the peculiarity of having only two distinct seasons, one dry and warm, and one cold and wet. There are other parts of the world also characterized by a dry and a wet season, for instance Mexico and Central America, etc., but they differ in the important point, that whereas the climate of the raisin districts is dry during the growing or summer season, Mexico has then its greatest rainfall. While grape-growing may not be impossible under such circumstances, the curing and drying of raisins is impossible, except with the aid of costly and burdensome appliances, the expense of which will very much increase the cost of producing the raisins. The climate of the raisin centers is by no means uniform. As a rule, the farther north we go the less is the distinction between the dry and the wet season, the shorter is the former and the longer the season of rain. Experience shows that the less this distinction between the seasons is marked, and the shorter the rainless season, the less favorable is the climate for the raisin industry. The longer the dry season, and the less rain during the same, the more favorable is the locality for raisin drying and curing, supposing, of course, other necessary conditions are not absent. This absence of summer rains and cold fog is the most important climatic condition, and the one that more than any other decides upon the advantages of any certain locality for the industry under our consideration. A perusal of the reports from the different raisin districts will convince us of this. For California we need not refer to any special reports, as the newspapers are full of them every year from May to November, and it will suffice to state that any large amount of rain after the beginning of June, and especially in September, October and November, when the raisins are curing, is considered very detrimental, and sure to cause much loss. Heavy and continued rainfall during the drying season would not only injure the raisins, but might even totally ruin the crop. Any district where year after year such showers occur, would not be considered favorable for the raisin industry, and would no doubt be given up to something else. To show that these same conditions also exist in the Mediterranean raisin districts, we will here quote a few extracts from the United States consular reports from there. Consul W. E. Stevens, United States consul at Smyrna, writes:* "It happens occasionally that rain falls during the vintage time, causing heavy loss to growers through the inevitable deterioration in quality. This was the case last season (1883), and large quantities of raisins were in consequence shipped to France to be made into spirits." From Valencia another consul writes: "In the event of wet and damp weather, the hurdles (or grape mats) are piled up in sheds covered with mats or painted canvas. Of course in this case the drying is retarded, the quality of the fruit deteriorates, and the expense and labor of curing are considerably increased." Two years ago ten thousand tons were thus damaged in the Denia district. While the Mediterranean districts are comparatively rainless during the summer time, still they are far less so than California. The rainy and dry seasons there are less distinct than with us.

Among the Grecian Islands, the production of currants is confined to only a few localities, principally on account of the untimely rainfall on the other islands. Dr. Davy (*Ionian Islands*, page 320) tells us: "The attempts to extend the culture of the currant to some other islands have been only partial, and attended with doubtful success. This, it is to be understood, is not owing, as has been asserted, to any unfitness of the soil on other islands, as it is analogous on them all, but rather to some difference of climate, especially about the times of ripening, gathering and drying of the fruit, consisting in greater liability to rain, a heavy fall of which is ruinous to the crop, and which, during the period of gathering in the currant islands, is considered a great calamity." But even in Zante and Cephalonia in Greece, the crop is sometimes greatly injured on account of rain. Thus in 1857 a crop of fifty thousand tons was expected, but disastrous rains in August injured the raisin grapes to such an extent that seventeen thousand tons were totally destroyed, and twelve thousand tons became unfit for anything else than distilling. Malaga in Spain, which of all the districts most resembles California, has undergone similar experiences, both damaging and ruinous.

---

* Consular Reports, No. 41½, June, 1884, page 745.

It is thus that the fall rains are everywhere feared the most, the more so where they may be expected with regularity, and where the district is so situated that the heat of the sun is not powerful enough to rapidly dry the injured crop. Thus in Valencia the rains are feared more than at Malaga. In the latter place the sun is powerful enough to dry the raisins, and only repeated showers would injure the crop. Our experience is very much the same, and the early fall rains in the northern part of the State are to be feared much more than rains at the same time farther south, where a few showers would soon be succeeded by warm weather, and a hot sun powerful enough to dry the partially cured grapes. On account of local conditions, certain parts of Central California are freer from these fall rains than the more southern districts, but this disadvantage is counteracted by the greater amount of warm weather and drying winds just at a time when they are most needed. But while the southern part of the State is in this respect not as favorably situated as some other parts, the disadvantage is greatly counteracted by the warmer and drier fall weather in October and November, and by drying winds which are often able to desiccate the moistened raisins in a very few days.

Spring rains in May or even in the early part of June cannot be considered greatly detrimental to the vines. On the contrary, if only occurring at long intervals, one or two showers say during the season, they are rather beneficial than otherwise. In California I have never known them to injure the crop, except if accompanied by heavy hail. Much alarm is regularly felt every time such a shower happens to come, but after it is well over it will generally be found that the vines look fresher and better, the ozone and ammonia which was brought down by the rain having acted as powerful fertilizers for the grape-leaves, and increased their vigor and growth. The only thing that might prove injurious at this or any other time of the growing season would be continued cloudy weather before or after such showers, which would cause mildew. Such weather has to my knowledge never been experienced. Occasionally spring rains also bring frost, and this of course is one of the greatest enemies of the raisin-vines.

Winter Rains.—In order that the raisin grapes may develop and mature without the aid of irrigation, the winter rains should be sufficient to keep the soil moist during the dry months. The absolute quantity of rain thus necessary varies in different localities. In California, generally, we would say that from twenty to twenty-four inches of rain would be required every year to keep the soil sufficiently moist to grow Muscatel grapes without irrigation. The nearer we go to the coast the less rainfall is required to supply this moisture, and the farther we go inland, the more elevated the land, the less rain is needed. Thus a regular rainfall of twenty-four inches would possibly not suffice on the low plains of the San Joaquin valley, while in El Cajon in San Diego county one-half of this rainfall is enough to grow the vines and mature small crops of very good and superior grapes.

It matters not from where the moisture comes,—from rain, seepage, moist air or irrigation,—as long as it is not present in excess nor too scant. In El Cajon valley the moisture appears to be held in suspense in impervious strata, or perhaps in strata which contain and preserve the moisture as does a sponge. In parts of Chile, as well as in Malaga and Smyrna, the winter rainfall is sufficient to grow crops of fair size and good quality, but it is almost certain that judicious irrigation in any of these places proves beneficial and remunerative. Of all the present raisin districts, Smyrna enjoys the greatest rainfall, often as much as thirty odd inches of rain. Of localities which grow raisins profitably with the least possible amount of rain, and without irrigation, Huasco and El Cajon take the lead. In Central California, as well as in San Bernardino county, no raisin culture would be possible with the natural rainfall. In foreign countries, Valencia and the Grecian Islands, as well as Morea, are similarly situated in not having sufficient rainfall to produce paying crops.

As a rule it may be said that, where the rainfall is sufficient to grow the Muscats without irrigation and cause them to bear good crops, the fall rains are also too frequent and too injurious to the drying grapes to allow a profitable raisin cult. The proper amount of moisture necessary to perfect the grapes cannot be ascertained by the aid of the rain gauge. While, as we have said, from twenty to thirty inches may be enough in Smyrna, from seven to ten inches suffice in El Cajon, and in Chile even less is required. The proper amount of moisture can best be told by the state of growth of the vines. The vines must have moisture enough to be kept growing up to the very time of the maturity of the grapes. The proper sign of this is the green and fresh color of the young shoots or the tips, combined with a certain vigor of the tendrils. When the tips cease to grow, and the tendrils begin to dry up, then the moisture has begun to give out, and irrigation should have been resorted to; the winter rains were not sufficient.

Frosts in Spring and Winter.—One of the frequent effects of spring showers is spring frosts. They are always injurious to the tender Muscat vine, and if occurring more than once during the same spring may entirely ruin the crop. In California such frosts occur sometimes in April, and observations inform us that they are most to be feared between the tenth and fifteenth of that month, while sometimes they come even later. The young buds are then either opening or fully developed into shoots, which the lightest frost will blacken and cause to dry up. Where the vines are irrigated and strong, one such frost may not ruin the crop, as new buds will start out in place of the old ones destroyed, and new shoots and new blossoms will come out. I have seen as many as three such crops of shoots develop from the winter buds, but each succeeding crop of such shoots is weaker than the preceding one, and bears less and later grapes. Happily, these frosts occur but very seldom in the Central and Southern California raisin districts, and during fifteen years of observation I have seen only three such frost years in which the branches were partially injured. In neither of these seasons was the crop materially injured as to quantity, the principal effect of the frost being a retarding of the crop for a week or more. Smoking of vineyards can only be successfully carried out in small valleys sheltered from heavy winds, but on the open plains such smoking is accompanied with difficulties, and its effect is uncertain. The growing of a limited number of windbreaks has in the Fresno district no doubt modified the climate, and made spring frosts rarer and less to be feared.

While the spring frosts are injurious to the grapes, winter frosts are on the other hand most beneficial, if not necessary to a continued raisin cult. The raisin grape must have a season of recuperation, and winter frost is the only climatic phenomenon which, without injury to the vine, can procure it that rest which is so necessary for all deciduous trees, by nature destined to enjoy alternate periods of growth and sleep. The absence of frost causes the sap of the vine to circulate more or less in the wood, and the vine never ceases to grow. This is one of the reasons why our deciduous vines do not succeed well in the tropics, where there are no cold seasons to cause the leaves to fall and the sap to become dormant. In the tropics, therefore, our deciduous vines keep on growing, set little or no fruit, and prove unprofitable. This phenomenon is shared there with other trees, and peaches, pears and apples act in the same manner. They all appear to need the rest afforded them by the winter frosts. It is also a question of very great importance, whether the continued and unnatural activity of the vine, at a time when it should be dormant, does not invite diseases of various kinds, which find the exhausted vines unfit to withstand their ravages. It may be possible that *mal nero*, the vine plague and other similar and as yet insufficiently understood diseases, are especially destructive to vines growing in frost-free climates, while in colder climates they make but little headway, the vines as it were being protected by the heavy frosts, which either kill the enemies of the vine or enable the latter to gather the necessary strength to battle with them through the growing season. There can be little doubt that at present the healthiest vineyards are those growing in countries where winter frosts are severe, but on the other hand we know that grapevines have been growing for ages in temperate climates, where the frosts, even if not entirely unknown, are still of very rare occurrence.

Summer Temperature.—The temperature in summer time must be sufficient to properly ripen the grapes, but must not be so great as to injure them either while they hang on the vines, or while they are exposed to dry on the trays. The average heat required to do the work of maturing is not exactly known, but it is certain that a very high degree is not absolutely needed to produce sweet grapes. As far as our experience goes, it seems that cool weather, with the average temperature of ninety degrees Fahrenheit, would be most beneficial in the fore part of the season, while when the grapes begin to ripen a greater heat is desirable. It is not the warmest countries nor the warmest seasons which produce the earliest grapes. Thus while the season of 1888 was in California unusually cool, with the thermometer seldom reaching one hundred degrees in June and July, the raisin season was nevertheless a very early one, and much earlier than seasons remarkable for their early high temperature. In Malaga and Smyrna, the heat seldom reaches one hundred degrees, and the grapes ripen several weeks earlier than in Fresno, where the summer temperature averages ten degrees higher. In Fresno, on the contrary, the season is earlier than in Southern California, where probably the seabreezes retard the ripening of the grapes. A temperature of over one hundred and five degrees proves injurious to unprotected or exposed grapes in the central region of California, but in San Diego county several degrees less is sufficient to scald the grapes or give them a cooked flavor if they are already exposed on the trays to dry. It is certain that with an average highest temperature of ninety degrees, the grapes develop better and become larger and sweeter than where the heat is excessive and reaches one hundred and ten degrees or more.*

The time when the greatest temperature occurs is of practical importance. Excessive heat can be tolerated by grapes protected by leaves and branches or otherwise sheltered, but if it happens at a time when the bunches are exposed to dry on the trays, the injury to the berries will be great or even ruinous. Early localities are especially apt to suffer in this way, and it is well to experiment before too much confidence is placed in very early regions. To such places, however, there remains the possibility of curing the raisins in partial shade, as is done in Chile, thus producing raisins of an entirely different type from the Malaga or California product.

Winds, Injurious or Beneficial.—In the California raisin districts hot, electrical winds are much feared in the months of June and July, or before the grapes have begun to ripen. In the San Joaquin valley these winds come from the northwest and sweep down over the vines, often scorching the leaves and frequently drying the berries on the exposed side. In the course of a few days the berries dry up entirely, and the whole bunch is lost. These drying winds are not peculiar to any certain part of California, but occur from time to time in every raisin district on the coast, in the south as well as in the center, on the coast as well as inland. The remedy is to grow the vines low and to keep the berries well covered. The planting of windbreaks will also modify these winds, and in places where they formerly were common they have now entirely ceased or become so modified that they cause no injury to the grapes, but prove even beneficial on account of the quicker and better maturing of the fruit. In certain districts, especially in San Bernardino and in Orange, some very drying winds are experienced late in the season,—in September and October. For the raisin-growers these winds are a blessing. They quickly dry the exposed grapes, which have been retarded in drying, or perhaps even injured by a previous shower of rain or by continued heavy dews. These winds are undoubtedly desert winds, and similar to the Terral of Malaga, which, sweeping over the inland plains of La Mancha, reach the coast vineyards and quickly mature the grapes. In Malaga there is also a moist southern wind, the Levante, which retards the ripening and the curing of the grapes, and which must be considered as our southwesterly fall winds, which, saturated with moisture, swell the overdried raisins as well as prevent the yet green grapes from drying. They are precursors of the rainy season, and warn the grower to prepare his dryer if he possess one. In Greece and Smyrna such hot or moist winds are also known and feared, and cause at times much damage in one way or another. We might here also mention the cold "northers" which are common in the California raisin districts in springtime, and which sometimes both cause the young shoots to break off from the old wood and make it easy for the mildew to attack the flowers or the young berries of the vines. Against these northwest winds we have two remedies, summer pruning and sulphuring, which, if applied in time, are both quite effective.

---

* Whenever the temperature is referred to it means the degree of heat (Fahrenheit) in the shade, and not in the sun except when so expressly stated.

Fogs and Moisture in the Air.—It is certain that the air in the California raisin districts is much drier than that of the Spanish or Mediterranean districts generally. The night air is, in these districts, loaded with moisture, and dew is heavy and frequent, even in the middle of the summer. The air in Malaga and Smyrna feels quite moist, and without this moisture in the air the vines would grow less and require irrigation. In these places the raisin grapes grow on the steep hillsides without irrigation, but in California this could not be done anywhere except in El Cajon or in other parts of the San Diego district, where the air is considerably moister than elsewhere. This increased moisture is partly caused by the increased rainfall in these districts, and partly by their nearness to the sea and fogs. This moisture in the air will, when other conditions are equal, greatly benefit the grapes, causing them to grow larger, and the thickness of the skin is materially diminished. Combined with this moisture in the air, fogs are injurious or indifferent. There is always a great difference between warm fogs and cold fogs, and now I speak principally of fogs from the ocean. Warm fogs are not particularly injurious to the grapes, generally indifferent and sometimes even considerable of a benefit to the proper development of the grapes. In Malaga, San Diego and in Chile the Muscat grapes grow and thrive actually within the reach of the spray of the waves, and fogs are there not uncommon, but they are warm. It would seem that such a climate would cause mildew or oidium, but I cannot find that these fungi are particularly frequent in San Diego county, while in Malaga they are but little more common than in the inland districts of our State. But as we go north the cold fogs become more common, and the vines thrive less under their influence. North of Los Angeles county the Muscat vines do not enjoy the coast air, while even in Orange county the interior vineyards are preferred to those closer to the coast. But anywhere, even in the best situated districts, protection from the direct influence of the sea fogs is appreciated, and the best localities are those in which low hills afford this protection by modifying and increasing the temperature of the fog or sea air.

In Central, and in the larger part of Southern, California, the inland valleys are the most successful raisin-producing districts, while even in San Diego county, where the Muscats seem to thrive at the very seashore, the interior valleys alone afford the necessary heat and dry air for curing the grapes and transforming them into raisins. According to Consul G. H. Heap of Constantinople, the positions preferred for vineyards in Turkey are the slopes of elevated and sheltered undulating lands, or on the sunny hills that do not lie too near the coast, or are naturally protected from the cold winds and fogs of the sea. The Island of Cos or Zea is called the paradise of the Sultana grape, because Nature has given the cultivable land there the best possible protection from the direct influence of the fogs. In Malaga, according to Consul Marston, eighty per cent of the vineyards are situated on the hills and inland, ten per cent on the valley lands or plains, and ten per cent on the coast. With the exception of some of the San Diego vineyards, California cannot show any raisin vineyards as close to the coast as those found in Malaga. The main El Cajon vineyards are from ten to fifteen miles inland, while the former Santa Ana vineyards were situated from eight to twelve miles from the coast. The San Bernardino raisin vineyards are from twenty to thirty miles inland, while in the San Joaquin valley the raisin districts are more than a hundred miles from the coast, while the sea wind, before it reaches any of the vines, has been modified by passing over from two to three hundred miles of dry country.

Ideal Conditions of Climate.—There remains only to draw some conclusions from the above facts. We are often asked what are the ideal conditions, as far as climate is concerned, for the proper development of the raisin grape, and for the proper curing of the raisins. Could we select such an ideal spot, where all the requirements for the raisin industry could be found in their highest perfection, with as few of the drawbacks as possible, our choice would be as follows: A moderately dry air, a frostless spring, a rainy winter and a rainless autumn. The temperature in the summer should vary between ninety and one hundred degrees, the fall months should now and then be visited by drying winds, while the winter frosts should be heavy and regular, but not below twelve degrees. Some have suggested that absolute freedom from any rain would be very desirable, as then no interference would be experienced with the cultivation of the grapes, but I doubt if the soil in such districts would not be rapidly exhausted through the want of weeds, the plowing under of which enriches the ground and enables it better to preserve the moisture provided for it by irrigation.

SOILS.

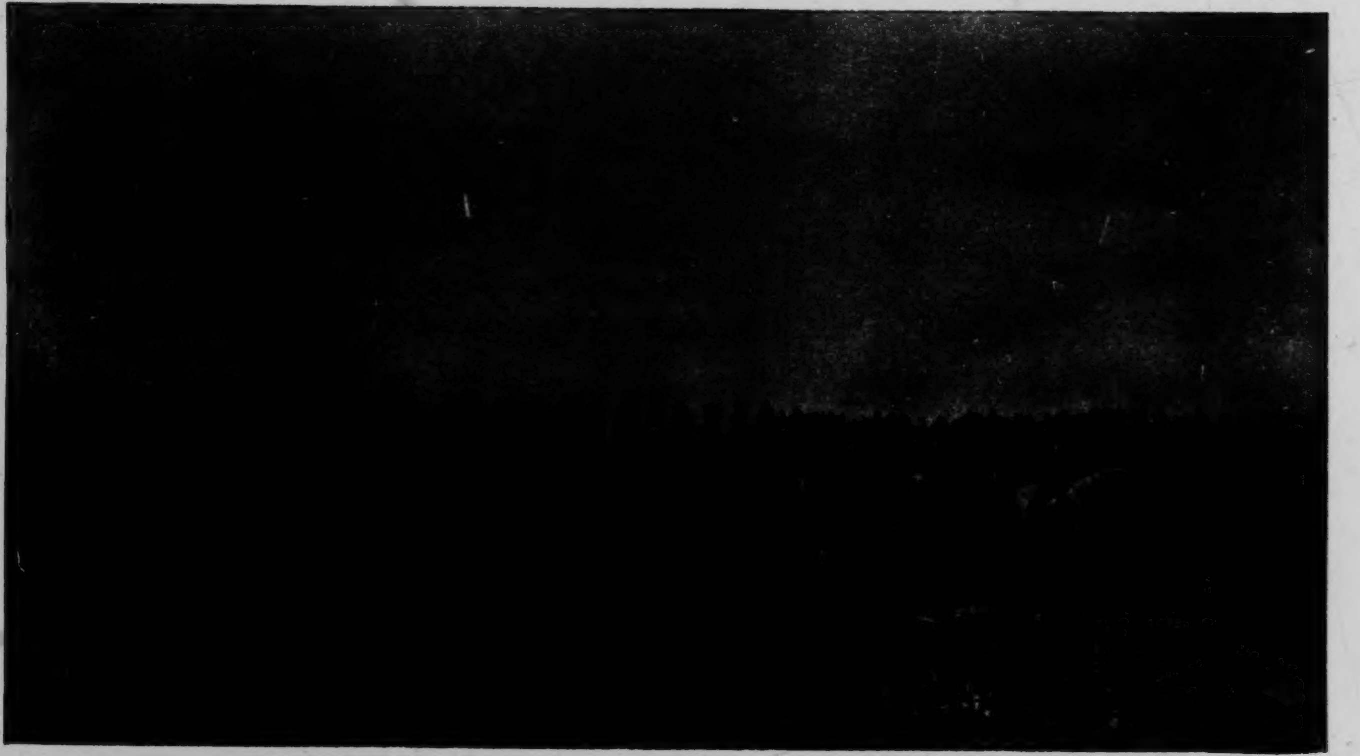
General Remarks.—No one certain variety of soil can be said to be the best for raisin purposes, and both in different countries, as well as in the same district, various varieties of soils are valued equally. Every raisin district has, however, its favorite soil, which is supposed to have some peculiar advantages for the raisin grapes, but upon closer investigation we generally find other varieties of soils which are not inferior. Growers who have succeeded with raisin grapes on one variety of soil are only too apt to consider this kind preferable to any other. This is especially the case in California, where soils vary so much and where in some districts it is difficult to find forty acres with a uniform soil. Whether the soil is black, red or gray, it makes but very little difference, as long as it is rich and susceptible of the highest state of cultivation and has the faculty of retaining moisture. The deeper and richer the soil the better the Muscatel grape will thrive and produce, and as such soils are most generally found along the banks of creeks and rivers, or in their bottoms and sinks, we might conclude that in such localities the best soils for the Muscat grape may be found. Other varieties of raisin grapes, such as the Malaga (California) and the Sultana, do well in less rich soil; indeed, they bear profitably in places where the Muscat would be a failure. It is therefore important for every vineyardist to carefully select his soil and then plant on it the proper variety of vine.

Malaga.—The soils of Malaga are of various kinds. The best is a reddish loam containing much gravel, both coarse and fine. This soil is very stiff and hard, and when dry is as solid as a brick. The red color is derived from oxide of iron or other iron compounds, which many of the best vineyardists consider a most desirable element in any raisin soil. The upland vineyards, or those on the slope of the hills, contain soils of decomposed clay and slate mixed with more or less gravel and sand. The Dehesa lands contain alluvial deposits of a black or gray color.

Valencia and Denia.—In this district we find soils of many different grades and colors. The sandy and gravelly soils are considered as producing the finest flavored raisins, and those having the best keeping qualities, while the rich, loamy soils of the valleys produce raisins of inferior flavor and keeping qualities, but of larger size and more per acre. For economical reasons, the latter soils are preferred, as they alone can be irrigated and made to produce large crops. Some of the best vineyards in this district contain a gray, ashy soil, quite similar to the white ash of the Kings river lands, while others are growing on a red clayey loam similar to the California red soil.

Smyrna.—The raisin-grapes of Smyrna in Asia Minor are almost exclusively grown on a white limestone soil, which consists of decomposed white rocks mixed with a stiff ocher-colored loam. This soil is so rocky that it must first be cleared, and the large rocks are carried away and used for boundary walls. This is the soil in the coast districts. In the interior the Sultana vines, as well as the Muscats, are replaced by fig orchards and other trees which delight in sandy soil,—too sandy to produce profitable raisin crops.

Zante.—The soils of Zante, the home of the Currant grape, are of various kinds. The heavy marl of the plains, which contains a large percentage of gypsum or sulphate of lime, is considered the best; indeed the gypsum is by many considered indispensable, or at least highly beneficial, to the above variety of grape. Other soils are red clay, gray marl and gravelly loam, all containing an abundance of lime. The Currant grape grows well and produces well on all these different soils, but does the best on the gypsum soil, which is therefore the most valued. On other soils the bunches are less solid, and the quantity of grapes produced is somewhat less, while their quality is inferior.



Scene in a Fresno Raisin Vineyard: Raisin Trays Exposed for Drying

Chile.—The Huasco grape grows in the valley of Huasco, on the coast of Chile, in a soil that is very light and red, containing a great quantity of sand. While very light in weight, this soil is said to be very rich in plant food, and yields good crops.

Fresno.—The Fresno soils are of several kinds, but the three principal varieties are red or chocolate-colored loam, white or gray ashy soil, and a light, very sandy, loam. To this may be added the deeper gray bottom soils or alluvial deposits of the Kings river. Each one of these varieties have different grades more or less suitable to the Muscatel grape. The best grades of each are equally valuable, while again the poorer grades are not to be recommended. The deep chocolate-colored loam is by many preferred, and the largest and most successful raisin vineyards are now located on this soil. But even in the best districts the soil varies to such an extent, that while one twenty-acre field will yield 250 boxes of raisins to the acre, the adjoining field, with only a slight change in the soil, will yield only seventy-five boxes to the acre. The best grades of the white ashy soil are also very good, and almost identical with the gray bottom-land deposits of Kings river. The light sandy soil should be avoided for Muscat grapes, but may do for Malaga and Sultanas, especially if judiciously fertilized.

Other Soils in San Joaquin Valley.—In Merced the best soil is heavy chocolate-colored loam, in places redder, in others darker, almost blackish. It is generally mixed with some gravel. As a rule, all the red soil in the San Joaquin valley is of the same characteristics, and well suited to the Muscat grape, provided the ground is sufficiently level. In Tulare county the proper soil for the Muscat is found to be the bottom lands of Kings and Kaweah rivers, as well as the deposits of the smaller creeks. This variety of gray alluvial loam is exceedingly fertile, and there is none superior for the Muscat grape. But an admixture of alkali often spoils soils which otherwise would be considered the very best. A similar soil is found in Kern county, especially near Kern Lake, and which must be rated among the best in the State, its color being a deep bluish gray. The vineyards of Yolo and Solano counties are located on a very similar soil, rich in humus, lime and phosphates, but more yellowish or pale chocolate colored.

Orange County.—A similar rich alluvial deposit is found in Orange county in the fertile district known as Santa Ana valley. The soil around Anaheim, Santa Ana, Orange and Tustin consists of a more or less dark alluvial loam of unsurpassed fertility, and especially adapted to the Muscat grape. It varies as to the percentage of sand and gravel. The sandiest soil in this district, while less rich, brings the earliest grapes, which come to perfect ripeness several weeks before those grown on the heavier soils, but the latter produce the best raisins.

Redlands and Riverside.—The Redlands soil of the mesa lands is reddish, rather darker than the same quality of soil in Riverside and Fresno. It is mixed with sand and gravel, and partakes strongly of the nature of the red or chocolate-colored loams of the State. The Lugonia bottom soil consists of a very sandy loam, on which the

Muscat grape has proved a failure. The best Riverside soil is red or chocolate-colored sandy loam, so often spoken of. Towards Rincon we find alluvial bottom soils producing grapes of superb quality and size. The soil of the San Bernardino district resemble the red Fresno soils, while the white ashy soil is not found there.

El Cajon.—The El Cajon valley soils are of three or more kinds: Rich red clay mixed with gravel, with the color changing from lighter chocolate to deeper reddish. This is a very desirable soil,—a steel gray or slate gray adobe with much gravel of a coarse nature; a black adobe with some gravel; an alluvial sandy loam consisting of decomposed granite mixed with much vegetable matter and humus. The El Cajon soils, while sandy and gravelly, produce exceedingly sweet and highly flavored grapes but comparatively small crops.

Subsoils.—The subsoil in a raisin vineyard is of great importance. Properly irrigated soils, if they are sufficiently rich, need not necessarily be very deep, as the raisin grapes, especially the Muscat, seldom extend deeper than eight feet below the surface. Even from four to five feet of rich soil may be considered as enough in irrigated vineyards, where the water is abundant. In poorer soils, or in districts with less irrigation, the roots of the vines penetrate much deeper, and the importance of the subsoil in such cases is apparent. Any rich subsoil will serve our purpose. It is always best to thoroughly investigate the subsoil before the vineyard is planted, and in doing this the following points must be considered: The subsoil should be as rich as possible, and there should, in no instance, be less than four feet of rich top soil. *Very* sandy soil or pure sand is not a proper subsoil for raisin grapes. Such soil will cause the top soil to dry too quickly after each irrigation, and will cause the top soil to leach out, while it besides gives no nourishment to the vines. Hardpan is not desirable, not even admissible, except in places that are or will become subirrigated. Alkali or salty subsoils will soon spoil the quality of even the best top soil. This especially is the case in irrigated districts, where the salts of the subsoil are carried to the top by the rising waters or by the continued irrigation. Hardpan which readily dissolves when wet is not injurious.

Hardpan Soils.—While I have alluded to them already, a few more remarks on these soils are here in place. The hardpan consists of a stratum of hard soil or hard rocky substance below the top soil. The depth at which the hardpan is found varies. In places where it is situated eight or ten feet below the top surface it does but very little harm, and may even prove beneficial in localities where water for irrigation is scarce, as it checks too rapid drainage. If the hardpan is situated closer to the top soil, it may seriously interfere with the vines, and if too close, or say within two or three feet from the top, it makes such soils entirely unfit for raisin grapes. If situated somewhat lower down, say from four to six feet, the hardpan does no great harm in subirrigated districts, while, in places where irrigation is not used, it leaves the top soil too shallow and too dry. But allowance must always be made as to the nature of the hardpan. Some varieties of hardpan are so hard that they can best be compared to regular stratified rocks, impenetrable to the roots of the vines, and impervious to water. Other hardpans again are softer, and allow the vine roots to penetrate more or less readily, while some again are so soft that they dissolve in water and make good soil for the vines. If the hardpan is very shallow, it may pay to blast holes through it, in order to allow the roots of the vines to penetrate to lower soils. But if the hardpan is thick and hard, and if there is no immediate prospect of subirrigation, it is better to use such land for some other purpose than for raisin-vines, which will only pay properly if grown under the most favorable circumstances, and on the best and deepest soils.

As to the nature of the hardpan, a few remarks may prove of interest. The hardpan can best be compared to a stalactite formation similar to those found in various caves. It has been formed very much in the same way as they were. In caves the rainwater, that seeps down from the top surface, dissolves various substances, especially carbonates (and silicates even) which again are deposited on the underside of the cave roof. This precipitation of hard material is caused both by evaporation of the water, as well as by attraction and adhesion. Such redeposition of dissolved minerals is seen for instance if solutions of salt in water are passed through tasteless and clean sand. The water will come through sweet and tasteless, the salt having adhered to the surface of the sand grains. Similarly, if a hole is dug near the seashore in the sand, the salt water will seep through, and form a well of more or less tasteless drinking water. In the formation of hardpan, this is exactly what has taken place. The rainwater has dissolved certain elements, such as carbonates of lime, or carbonates of sodium and various other salts, and in its way through the lower strata of the soil these dissolved elements have again been taken up by the sand and cemented it together. Thus it is explained why hardpan upon examination is so often found to resemble sand or sandstone: the lower sandy strata of the soil have been especially effective in causing the lime in the water to adhere to the numerous surfaces of every individual grain of sand. In hog-wallow districts the hardpan is found principally between the individual hog-wallows, but rarely in or under them. The rainwater has here carried the minerals in the soil to the deeper places betweeen the hog-wallows, in which it has accumulated to a greater extent than anywhere else, and thus formed a heavier hardpan. In flooding the hog-wallows, the top of every hog-wallow is seen to settle and fall in, there being no hardpan below it, if the sides of the hog-wallow are steep. Where the hardpan consists principally of lime compounds, its chemical composition is not detrimental to the vines. But where the hardpan is cemented by alkalies more or less soluble in water, these deleterious substances will dissolve and rise to the surface to the great detriment or even to the total destruction of the vineyard.

Comparative Value of Soils.—The river bottom soils, or soils formed by the deposit of creeks, are with few exceptions rich and deep, and contain in abundance all the elements necessary to produce a superior Muscat grape. Such soils are, however, often injured by subsoils containing mineral deposits, which will injure the vines, or by hardpans, which will cause the soil to dry out. Poor soils will not prove profitable, and rather than plant vines on such soils it would be better to plant no vines at all. The rich soils are not only the heaviest producers, but the vines grown on them are stronger and healthier and in every way better able to resist the attacks of insects and fungi and the ravages of other inexplicable diseases. But regardless of these advantages the various soils leave their effects on the grapes, some of them producing sweet and very keeping raisins, while others cause large berries and bunches, which bring the highest market price. Thus the lighter and drier soils produce richer flavored and sweeter raisins than the wet and rich soils, which again produce the largest and handsomest grapes. On the latter soils the raisins when cured will be found to be dark and covered with a heavy bloom, while the raisins from the sandier or gravelly soils are lighter in color and with less pronounced bloom. The keeping quality of the raisins from gravelly soils is well known. In California the keeping quality of the raisins is seldom inquired into, as our raisins keep remarkably well and are in this respect superior to those grown in Spain. This may be from the effect of our drier climate more than from any certain quality in our soils.

As a rule it may be said that poor soil causes the raisins to mature earlier than the rich, heavy loams, and on this account the latter are to be greatly preferred, as the earliest raisins in any district are never as good as the bulk of the crop, and are in demand rather as a curiosity, and for the purpose of supplying an early market, than through any superior qualities. In some districts there is such a great difference in the time of ripening upon the various soils that the grapes grown on the earliest soils are used only as table grapes fresh. In planting a raisin vineyard, the future profits depend upon the choice of land, and it is far better to pay a high price for the best land than to take the inferior land as a gift. Few of those who now enter upon raisin culture take the proper care in selecting the land, neither do they sufficiently, if at all, realize the advantages of the rich soil, nor the disadvantages of the poor land.

Alkali Soils.—While nothing but first-class land is to be recommended for raisin vineyards, and alkali lands are of all soils those least suitable for our purpose, still a consideration of these lands will interest many raisin-grape growers. The best lands for raisin purposes in California are often contiguous to alkali lands, or to land containing more or less traces of alkali. A vineyard on the best soil contains often spots charged with alkali, and it may be inconvenient for the grower to allow these spots to lie idle, and he would prefer to fill them up with vines. The first work must then be to get rid of the alkali or reduce it to such an extent that it will not prove injurious. The general alkali lands are classed in three kinds, according to the quality of the alkali.

1st. Alkali salts, such as carbonates and borates. These are greatly detrimental to the vines, and no vines could be expected to do well in such soils, as even the smallest percentage of this alkali is injurious or even ruinous to the crop. In clayey soils these alkalies cause the clay to harden in such a way that no good tilth can be obtained. The land may be plowed ever so much, it will only turn up in chunks and never become properly pulverized. These true alkali salts consist principally of carbonate of sodium (sal-soda) or of carbonate of potassium (saleratus). *Remedies:* Gypsum, land-plaster, or leaching with water.

2d. A second class of alkalies are the sulphates and chlorides, all soluble in water. Such salts are: Magnesium chloride (bittern), magnesium sulphate (Epsom salt), calcium chloride, etc. These salts, when not present in too large quantities, are easily counteracted by lime.

3d. A third class of alkalies is composed of neutral salts, such as chloride of sodium (common salt), sulphate of sodium (Glauber salt), sulphate of potassium, all soluble in water, but not convertible into less injurious substances by lime or gypsum. These salts do not bake the soil, but rather contribute towards keeping it loose and mellow.

The remedies which are practical and not too expensive may be divided into several classes, which, if used in combination, may prove effective, while each one of them used separately would fail.

1st. Leaching with water. All soluble salts may be leached with water. The alkali land should be checked and so ditched that the water from each check can be drained into a waste ditch. But, besides these waste ditches, drain ditches should be made for the purpose of draining off the water, say to a depth of four feet below the surface. The *modus operandi* consists in first flooding the soil, and while the check is yet full the floodgates are opened and the water drawn off into the waste ditch, when the water will carry off the salts which have been dissolved in it. A second or third flooding should be allowed to settle in the soil and be drained off below into the drain ditches. The drawback to common leaching is that under certain circumstances the water may deposit its alkali in lower strata, especially if they are sandy, and there form hardpan or alkali accumulations. A much better method is under-drainage by means of pipes or gravel drains constructed all through the tract at certain regular distances. This under-drainage, if properly constructed under conditions favorable for its perfect working, is by far the best method of freeing alkali soils from their superfluous salts. To what extent this system is practical depends upon circumstances. To reclaim large districts by this method may not prove economical as long as good land is plentiful and cheap, but where smaller alkali tracts are surrounded by soil, and where it is of importance to get a uniform plantation, under-drainage by pipes or common drains is both the surest and most practical solution of the alkali problem. Under-drainage is strongly recommended by Prof. E.W. Hilgard, who has repeatedly pointed out its value, and who has called the author's special attention to this as yet little understood remedy.

2d. Deep and constant plowing. Deep and frequent plowing acts in various ways. By being mixed with a larger quantity of soil, the alkali is diluted sufficiently to not cause any serious injury to the crops, the damage generally being done near the surface. Constant plowing also prevents evaporation, which carries the alkali to the surface and deposits it there. This method can only be successful when the alkali salts are limited in quantity, and no one need expect to be able to rid badly charged lands from their alkali by plowing it under.

3d. By plowing under green or dry crops. If grain can be made to grow on the alkali land at all the turning under of it, either green or dry, will in course of time greatly reduce the alkali. The turned-under stubble or straw forms in decaying an acid, which in many instances will combine with and counteract the effects of the alkali. Similarly, straw stacks spread on alkali spots and plowed under will considerably reduce the alkali. But manure containing ammonia and other salts should not be used, as it will, on the contrary, only increase the alkali by adding other or similar salts to those already in the soil.

4th. Cropping. If water, either in the form of sufficient rain or as irrigation can be had, alkali lands can be reclaimed by cropping. It is amply proved that beets and carrots, as well as other plants, such as salt-bush (*Chenopodium*), take up large quantities of alkali salts, and in the course of a few years render alkali soils available for grain. Wheat also extracts alkalies, and repeated croppings with grain will in the course of time prepare the soil for vines and trees. Bermuda grass will completely remove the alkali from soils to the depth at which the roots can penetrate, and must be recommended for the worst places. Afterwards, cropping with annual crops may be advisable before vines are finally planted on such reclaimed lands. The Australian salt-bushes, or *Chenopodium*, extract alkalies, and are besides liked by stock. They should be introduced to alkali lands and take the place of the California native salt-bushes, which are not eaten by stock. While being real desert plants, they yet require some moisture in the soil, but they could probably be grown anywhere on the alkali lands in this State where the rainfall is over three or four inches.

5th. By chemicals. The use of chemicals of various kinds in counteracting the alkali is not resorted to by our farmers as it should be. The principle upon which chemicals can be used is that obnoxious or greatly injurious alkalies may be changed into less obnoxious and less injurious salts, or even into fertilizers. The most available of these chemical compounds are gypsum (sulphate of lime) and lime (carbonate of lime). When the alkali consists mainly of carbonates, such as carbonate of sodium (sal-soda) or potassium carbonate (saleratus), in other words of the class which we have designated as class number one, the most dangerous and worst class of alkalies to combat, gypsum may be used as an antidote or rather as a means to convert these alkalies into alkalies of the second class, or the sulphates. The principle upon which this is done is to displace the sulphate in the gypsum and force it to combine with the alkali (sodium carbonate) and form sulphate of sodium (Glauber salt), an alkali belonging to the third class of alkalies, and which is twenty times less injurious to vegetation than is class number one. The change is made on the following principle, and might be thus illustrated: To the alkali in the soil (carbonate of sodium), add sulphate of lime. As soon as the mixture is made with sufficient water, a change will take place, and the substances (carbonate of sodium and sulphate of lime) will form new compounds. Thus we will get, out of those two substances, two new compounds, *viz.*, carbonate of lime and sulphate of sodium. Of these, carbonate of lime is not injurious to vegetable life, and sulphate of sodium (Glauber salt) is only injurious when present in large quantities. The carbonate of lime is not soluble in water, but the sulphate of sodium is, and can consequently be eliminated by underdraining or by flooding, as we have previously described.

To know when gypsum can be used is not necessarily a scientific matter. Mix some of the alkali in a tumbler with water, and allow the mixture to settle. In another tumbler mix some gypsum and water, and allow it to settle. Then mix the two clear liquids, which, if gypsum is an antidote and the proper thing to use, will be turbid or milky through the chemical combinations which take place. If the water remains clear, gypsum will not prove an antidote to the alkali under consideration. The use of lime is based very much on the same principle. If the second class of alkalies are present, and lime is added, the changes that take place may be illustrated as follows: Epsom salt (magnesium sulphate) combined with calcium carbonate, will form two new compounds, *viz.*, gypsum (calcium sulphate) and magnesium carbonate, both of which substances are less injurious to crops. But, as I have already stated, raisin-vines prefer soils which are naturally free from alkali, and should never be planted on soils which cannot readily be reclaimed. Chemical antidotes may do where the alkali occurs in a few spots mixed in among tracts of good soil, but where the whole field must be reclaimed some other crop than vines had better be first attempted. There is too much good and suitable soil in California, and until all this is occupied the alkali soils had better be given up to other crops than vines.

Fertilizing.—To this date but few grape-growers manure their soil. California has not yet been engaged in the raisin business twenty years, and her vineyards are comparatively virgin. The first raisin vineyards were planted on the deepest and richest soil, the soil which would naturally hold out the longest, but the croppings of a raisin vineyard are enormous, and when from eight to ten tons of green grapes have been taken from the soil year after year, it is but natural that the land should become gradually exhausted. In Spain it is considered that even the richest soils require manuring after ten years of constant cropping with Muscats, and the same experience is likely to become ours in California. So far, I know of not one vineyard which has yielded Muscat grapes for ten continuous years and still keeps yielding as much as formerly. Yearly the crop must become less, and finally will not be large enough to pay. The manuring of the Muscatel vines is fully understood in Spain, where all kinds of manures are used. When home manures fail in supply, the Spaniards use imported fertilizers, such as Mexican phosphates, etc. This fertilizer brings in Spain sixty-five dollars per ton, and is brought there from our very doors,—the Gulf of Lower California. It could be laid down here for, and is actually sold here now at, forty dollars per ton, or twenty-five dollars less than in Spain; still to my knowledge only very few raisin-growers in Fresno use it for their vines. In one year one of these succeeded, with the aid of this phosphate, in raising the crop of an acre of Sultana grapes from a very poor yield to over eight tons. The grapes were grown on a piece of sandy soil of the kind well known to Fresno vine-growers, and which is generally considered as less suited to raisins, lacking in fact in more than one of the necessary qualities of a good raisin soil.

It is certainly a wrong policy to crop the soil until the grape crops begin to fail. The soil will then be so exhausted of several of its ingredients, that it will take the most scientific treatment to bring it back again to what it was formerly, and it is even questionable if this could be done in a way that would prove profitable. Experience in Spain teaches that vineyards which formerly used to yield from eight to ten tons of green grapes to the acre now, after years of neglect, only yield two tons to the acre, and even with expensive manuring can in no way be brought back to their former fertility. On the other hand, we know that vineyards which have been fertilized from the beginning have for fifty years been kept up in apparently as good condition as at first; it is accordingly this method that must be recommended. The manure or fertilizer must be varied occasionally. In rotation, phosphates, bone dust, guano, stable manure, sheep manure, lime and plaster of Paris or gypsum may be used, but it is best to have every variety of soil in the vineyard analyzed, and to apply from year to year that kind of fertilizer which is particularly needed. The phosphates are those which will first give out in our California soils. Phosphates must therefore be considered as the best fertilizers we can use, but the quantity to be used must always be determined by a practical chemist. Of these chemical fertilizers, it is dangerous to use too much, as they might injure the vines, and from fifty to a few hundred pounds to the acre may in some instances suffice and produce better crops than would four or five times as much. But, regardless of chemical fertilizers, the cautious raisin-grower should endeavor to return to the soil as much as he possibly can out of the wastes of his crop. The refuse of stems and berries, which are wasted at the stemmer and in the packing-house, should not be burned, as is generally the case, but returned to the vineyard, and applied one year on one piece of ground, and another year on some other piece. If, however, these wastes must be used as fuel in the dryer, etc., the ashes should be carefully collected and spread over the soil, and kept dry and shaded until thus used.

Another most valuable fertilizer generally wasted is the trimmings. In our careless California farming, these trimmings of the vines are put in piles on the roads, outside of the vineyards, and there burned. Thus the ground loses the most powerful soluble salt, which would greatly increase the yield of grapes and the profits to the farmer. Where the vines are planted far enough apart, the trimmings may be burned between the rows of the vines without injury to them, but, when the vines are set close, there is no other way than to carefully collect the ashes and spread them evenly over the soil. Some vineyardists use large troughs made of galvanized iron and perforated with holes. These vats are drawn through the vineyard by a team, and scatter the ashes evenly over the soil. The vats may be so constructed that the cuttings are burned in them directly as they are being pulled along, thus saving much labor as well as ashes. Such contrivances will probably only prove profitable in large vineyards, where there are long rows and few turnings for the teams. Even the stable manure in our State is not used as it should be. It is hardly possible to understand how vineyardists can be thoughtless enough to haul loads upon loads of stable manure on their roads or in holes and waste places, while their vines adjoining are suffering from the want of sufficient nourishment. In the irrigated districts, this is a very common sight, and the wet places on the road are often deep with manure and strongly smelling of ammonia. If the manure had been placed around the vines, the increase in crops would probably have been sufficient to enable the owner to macadamize or otherwise permanently fix the roads.

IRRIGATION.

Introductory Notes.—The irrigation of the raisin grapes was, for several years, considered as a practice entirely peculiar to California, but as our knowledge extended it was found that, far from being anything at all new, it had been practiced successfully for centuries in some of the Mediterranean countries. We have already mentioned how irrigation is customary both in the Valencia and Denia districts, as well as in Greece. It is evident that irrigation there is only limited by the supply of water, and that there is no question about its usefulness. As regards the methods of irrigation in these foreign countries, we beg to refer to the chapters treating of these countries. Here our efforts shall be to consider irrigation in its relation to the following points, which are of more general interest to the Californian growers: Necessity of irrigating the raisin-vines; the health of irrigated vines; the bearing quality of irrigated vines; the quality of the irrigated grape; supposed unhealthiness of irrigated vineyards; irrigation by flooding; irrigation by furrowing; subirrigation; seepage; drainage; irrigation and its influence on the soil.

The Necessity of Irrigating the Raisin-vines.—When the irrigation of raisin grapes was first attempted in Fresno and Riverside, hardly any one was acquainted with or knew that irrigation had ever been used for such a purpose before, and irrigation was considered as a venture which did not promise well for the future. Later on it was found that the raisin grape really would grow and do well in some localities without irrigation, and the latter practice was accordingly condemned. To-day, however, the practical knowledge of irrigation is greater and more generally distributed, and it is now fully understood that irrigation is not only not injurious, but beneficial and necessary in localities where the raisin-vine will not grow or bear sufficiently without it. The questions then arose, When is irrigation necessary, and how much irrigation is required? The first object in raisin-growing is the profit· a secondary object is how to so treat the vines that they will last as long as possible. To attain the first object, we must raise plenty of grapes, and when a larger quantity of good raisin grapes can be grown with irrigation than without it, irrigation is justifiable and necessary. In Spain, especially in the Denia district, irrigation of the raisin grapes is practiced wherever water can be had, and the same is the case in Greece and Italy.

In California the tendency is now to irrigate wherever water can be had, and wherever it is profitable to procure it. In Fresno, Tulare and Kern counties, raisin grapes could not be grown without irrigation. These same conditions are also found in San Bernardino county, while in Los Angeles and Orange counties all the best vineyards are irrigated, and only occasionally do we find the conditions such that irrigation is not absolutely necessary. In Northern California, raisin-vines may be grown without irrigation, but the latter is considered of such advantage that expensive pumping works have been erected in places where no other means were had for irrigating the vines. In San Diego county, especially in El Cajon and Sweetwater valleys, irrigation is not absolutely necessary, in fact it is not practiced there at all, although water could be had, but as a consequence the crops there are not as large. In Smyrna, in Asia Minor, the largest raisin center in the world, the raisin-vines receive no irrigation, but the unusually heavy rainfall of this section makes the want of irrigation less felt. Of course, outside of the raisin districts proper, Muscatels or other raisin-vines may be grown, and are grown to good advantage without irrigation, but the climate in those places is generally unsuited to the drying of the grapes.

Should we inquire into the reasons why raisin grapes may in some localities be grown and actually prove profitable without irrigation, we find the same to depend not alone upon the rainfall of the locality, but principally upon such other circumstances as dew, fog, the nature of the subsoil, and the moisture of the air. In Smyrna the rainfall of the wet season is from twenty-four to thirty-six inches annually, and greater than in any other raisin district. In El Cajon the rainfall is only half that much, and the moisture in this case must be sought partly in the subsoil, which is especially retentive of moisture, as well as in the dew, and the warm fogs from the ocean. The subsoil has the greatest possible influence, as in other valleys near by, where the fog and the dew are the same, but, where the subsoil is different, no raisin grapes can be grown without irrigation. Malaga is in this respect very similar to El Cajon and Sweetwater valleys, but it enjoys more rainfall than the latter places, while probably the dew and fog is about the same. Still in Malaga irrigation is used in a few isolated localities where it can be obtained, the nature of that country being such, that no general irrigation system is possible, and this is probably, more than anything else, the reason why the vines are not more generally irrigated there. In Chile, in the valley of the Huasco, the Muscat vines are grown both with and without irrigation, the conditions there appearing to be very similar to those of El Cajon valley in San Diego county. From the above we might draw a general conclusion, that wherever the raisin-vines cannot grow without irrigation, and wherever water can be had in sufficient quantities, irrigation is practiced in order to increase the crops and to make the business more profitable.

Health and Longevity of Irrigated Vines.—As regards the health of the vines, the old idea in this country that vines would suffer from irrigation is decidedly erroneous. The vines of Denia in Spain have been irrigated for eighty years or more, and are to-day the healthiest vines in Spain. Similarly, the Fresno vines, where the water level, as in Denia, is only from five to ten feet below the surface, show no signs of decay, while many of the raisin-vines in other parts of the State, especially where planted on the hillsides, show diseases which baffle the cultivator. I do not, of course, mean to say that irrigated raisin-vines are entirely free from diseases, but only that, so far, the healthiest and strongest raisin-vines of the world are those which are irrigated, and which have always been irrigated. Of course in this respect the Muscat grapes, as well as the currant vines, differ materially from certain wine grapes, which as a rule have originated on drier soils, and which, if grown with irrigation, deteriorate and yield inferior fruit. The raisin-vines require much moisture, and, if this is not supplied in one way or another, they will suffer and prove unprofitable. The same is observed in soils which rapidly lose their moisture. In such soils the Muscat is not at home, and its health and vigor is seriously impaired.

The Bearing Quality of Irrigated Vines.—In regard to the bearing quality of the raisin grapes under irrigation, we know with certainty that the irrigated raisin-vines yield by far the most. In Valencia and Denia, the vines yield from five to ten tons to the acre, and so do those of Riverside and Fresno, while the El Cajon unirrigated vines yield only from one to two tons per acre. If the latter place would irrigate judiciously, its Muscat vines would no doubt bear as well as those of any other locality. I am led to this belief from what I have seen of irrigated grapes elsewhere in San Diego county, which were fully as well loaded as the heaviest vines in San Bernardino county or Fresno.

Quality of Irrigated Grapes.—That the quality of the irrigated raisin grape is increased by judicious irrigation is readily seen in all irrigated districts, where those vines which receive their proper share of water produce the largest bunches and berries. But it is also evident that too much water will cause a deficiency of sugar in the grapes, as well as a lack of flavor, by which the irrigated grapes can always be distinguished from those grown with natural moisture. Grapes too freely irrigated are not alone wanting in sugar, but also in color. Such grapes remain green to the end of the season, and never assume that amber color so valued in grapes, and which always indicates beforehand what raisins they will produce when properly dried. In our interior valleys, where the sun and the wind sometimes produce sun-scald of the berries, which again causes them to fall off or dry up long before they are properly ripe, this defect is much more frequent on vines which suffer from want of water than on those which have had enough. When the soil is not subirrigated, it is therefore advisable to irrigate the vines at the end of June, just before the hottest part of the summer arrives. Similarly, irrigation will help to swell out the berries if applied just before they commence to ripen.

In conclusion we might with truth say that the raisin grapes may in many localities be grown without irrigation, but that in California, in

Greece and in Spain, the largest and most prosperous districts are those where the raisin-vines are liberally irrigated. The Muscat grape seems especially to love water, and, in the real raisin districts, the healthiest vineyards are those that are best irrigated. The berries and bunches are also increased in size, but not in flavor and aroma, by irrigation. In places where the raisin grapes will not bear without irrigation, the latter, of course, is a necessity. There are always naturally subirrigated parts, in every county or district, where artificial irrigation is not required. But these parts are generally confined to river bottoms or to natural sinks, which, so far, have played no important part in the raisin industry. Considered from a practical standpoint, irrigation of the raisin-vines is necessary in California, and, should it from some reason or other be made impossible, the raisin industry would not prove profitable or even possible, except in a few very limited localities.

Much has been written in regard to the supposed unhealthiness of the irrigated vineyards. The malaria prevalent in some vineyards is no doubt caused by irrigation; but it has been amply proved in Fresno and elsewhere that if the grower would know from the beginning how to so prepare his land that there would be no stagnant pools, no waste water, and no swampy grounds, the so much talked of malaria would be as rare in the irrigated vineyards as anywhere else. It is not the irrigation that causes malaria, but the waste of the water, the carelessness of the irrigator and the faultiness of the badly constructed irrigation works. After the vineyard has been irrigated a few years, the malaria leaves it entirely. This is the experience in Fresno where the vineyards, after years of irrigation, have become perfectly healthy.

Various Methods of Irrigation.—There are several methods of irrigation now practiced in the irrigated vineyard districts. We may irrigate by flooding the land or by leading the water in furrows between the vines. Both ways, but especially the former, may, if continued long enough, cause subirrigation, the most desirable state of irrigation. The choice of methods of irrigating does not always lie with ourselves, but depends upon the quantity of water at our command, the lay of the land, etc. Sometimes one method will in course of time give room to another, and again, after the lapse of a few years, continued irrigation may not be necessary or desirable.

Irrigation by Flooding.—This method consists of flooding the land either by means of checks and banks, which must have been constructed before the vines were planted, or in simply flooding ground which is naturally level. In either case the land must naturally not be too rough, and the water must be abundant, else this method cannot be used. It will always pay to engage the services of an engineer in preparing such ground for vines. The extra cost will be more than paid for in the first few years, when frequent irrigations of the vineyard are as necessary as they are expensive. The ditch supplying the vineyard should always run on the highest ground, and in no instance should it be run through low ground when high ground can be had, as the low ground may in the future have to be used for drainage, about which we will treat further on. From the main canal, branch ditches should run out at right angles if possible, or if the ground is very uneven they may follow the highest parts. The ground between these ditches should be properly leveled into checks. With checks the irrigator simply measures a piece of ground of any size which is surrounded by a levee or bank. This bank must be high enough to allow the water to cover all of the ground as soon as the check is filled with water from the ditch.

To make the ground level enough, it is generally necessary to level it with scrapers. The more level is the surface the better, cheaper and quicker will be the irrigation, and no small amount of trouble will be avoided if this work is properly done before the vines are planted. Too little of this leveling is done in some places, and I have seen thousands of acres planted in Muscat vines which were so improperly leveled that the profits of the vineyard in after years would be seriously interfered with. To understand how this can be possible, we must remember what takes place when we irrigate and after we have irrigated. The gate in the ditch is opened, the water flows out and runs immediately down to the lowest part of the check. When this part is reached, the check begins to fill up. If the ground is very uneven, it may take days to fill the check, and the lower part will require to be covered several feet with water before it will reach the higher parts, which always need irrigation the most. To back it up so high requires also a correspondingly high levee, which again is more apt to break and cause trouble and expense the higher it is. After the water has reached the highest possible point, the flow is shut off, and the water begins to subside. The highest part of the land becomes dry the first, and quickly, while it may take days or even weeks to dry up the lowest part of the check. When at last the check is all dry it may be found that the lowest vines have been injured or entirely drowned out. When summer irrigation is used, it is absolutely necessary to have the ground level, so that when it is flooded the water will not reach up to the grapes, as they spoil when coming in contact with the water.

The time when flooding should be used must depend upon circumstances. As a rule, flooding is especially adapted to winter irrigation, as, when the vines are entirely dormant, they may be submerged for months without suffering any harm. Young vineyards may also be flooded in summer time, but, when the grapes begin to appear, flooding can only be done in the winter or when the land is absolutely level, but even under the most favorable circumstances many grapes are always lost. Some have so prepared their vineyards that a check, when flooded, can be drained into a lower check or into a ditch. This is a very good arrangement where the land is not entirely level, as it will cause the low places to dry up as quickly as possible. But a better way is to have the ground so level that the water will sink evenly and leave no sinks nor any high and prematurely dry places. There are, however, soils so composed that the water cannot sink through them in any reasonably short time. Such heavy soils must be surface drained after every flooding, or perhaps had best be given up to some other method of irrigation. But such hard or impervious soils are frequently improved by irrigation, and in course of time lose their impervious nature and become subirrigated. If the land is tolerably level by nature, and there are prospects of subirrigation soon appearing, it may be unnecessary to level the land, and flooding with temporary checks may be used with advantage for the first few seasons. Furrowing will generally assist this mode of irrigation.

Irrigation by Furrowing.—This method of irrigation is practiced where the land is not sufficiently level to be flooded, or when the water is not sufficient to enable the irrigator in a short time to flood the land. The practice of furrowing simply consists in plowing furrows alongside of the vines, and then to lead the water in the furrows. This system is by far the one that is most practiced in Southern California, as it has some advantages over the flooding; it is, however, not so effective and cannot supply the vineyard with as much water as flooding. To use the furrowing system to advantage, the land must have been previously leveled, but not necessarily graded to an absolute level. It is enough to have the surface smooth and on an even grade, in order that the water may run from a higher point to a lower one without spreading or breaking out. Especially all knolls in the vineyard must be leveled off, and care must be taken to fill all hollows or sinks in which the water would otherwise collect.

After the vines are planted, or when irrigation is necessary, one or more furrows are plowed on each side of the vine, and the water is allowed to run in them for several hours, or even days, until the soil is sufficiently soaked. In many places three furrows are made between the rows of vines, and the water is allowed to run in at one end and out through the other in a stream only sufficiently large to cause all the water to sink. Where particular nicety is required, the waste water which runs out at the farther end may be collected in a trough with perforated holes, through which it is conducted to a ditch or lower check. Similarly, a long trough may be used for conducting the water to the land in the first instance, and allow it to run out through a number of small holes, one of which is situated in front of every furrow. When the ground is well prepared, level and with an even slope, this system of irrigation is very perfect, and causes but little expense and trouble in management. In Riverside the vines are irrigated thus every three or five weeks, while in Redlands less irrigation is used on old vines. As a rule, in Southern California the furrowing system is the accepted one as being best adapted to the nature of the country. The water is conducted both in open ditches and in pipes, and when under pressure saves much labor and expense which would otherwise be required for the continued construction and repair of ditches.

The furrowing system has, however, its disadvantages. It requires a longer time to fill the soil sufficiently, and accordingly it takes many more irrigations to accomplish as much as with flooding. As advantages of this system, we might state that it requires no banks or levees to back up the water, and a vineyard irrigated this way can be kept entirely free from weeds by a few cultivations, while a checked vineyard must besides be cleared with hand labor, as the banks and checks are apt to be destroyed by cultivation.

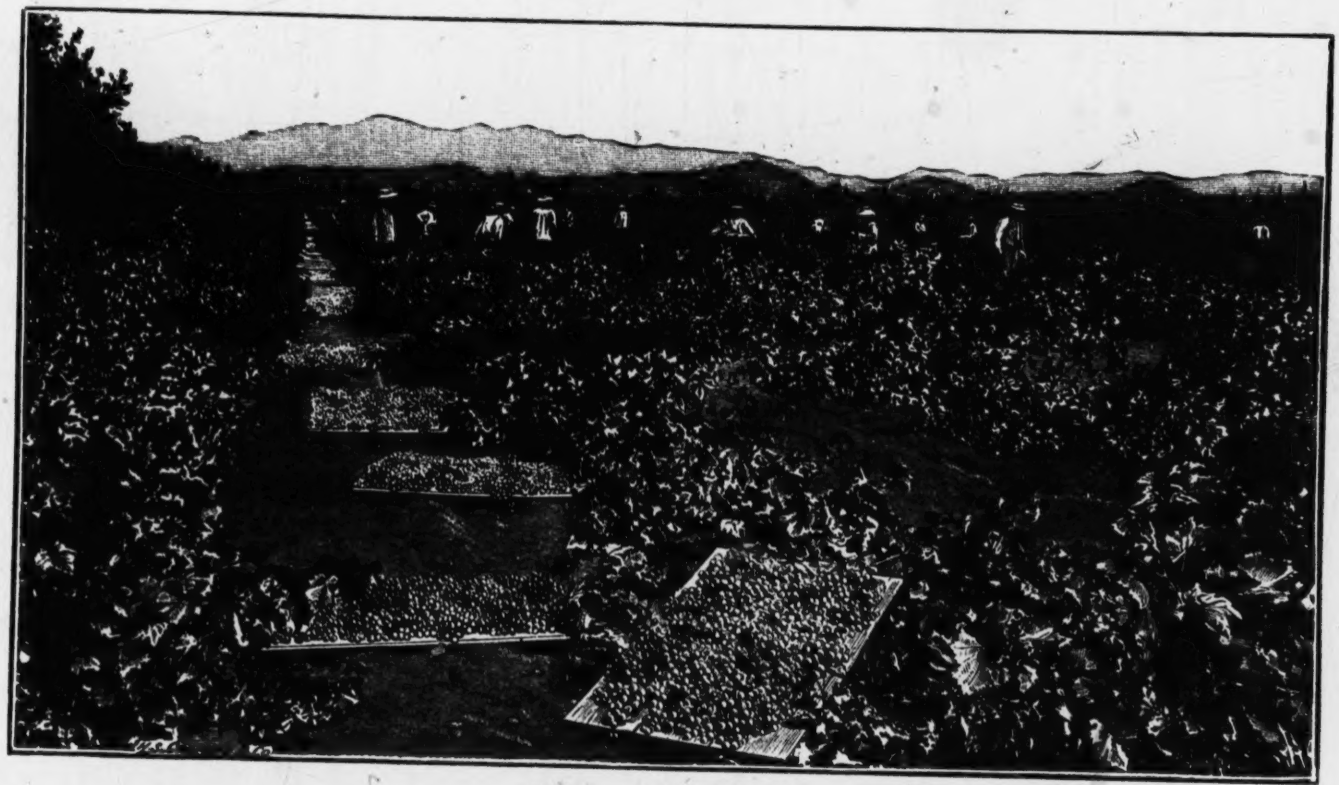
Subirrigation.—Subirrigation may be either artificial or natural. The artificial subirrigation has, as far as I know, only been used in a few vineyards in Yolo and Solano counties, the report, shortly after it had been established, being very flattering as regards its success. But of late years we have heard nothing about this kind of irrigation, and it is likely that some practical difficulty was encountered which could not be fully overcome. The artificial subirrigation consists in laying larger and smaller cement pipes between the rows of the vines. These pipes are perforated in various places, and, when filled with water under pressure, the water runs through the perforated holes and keeps the ground outside the pipes constantly moist, without causing the surface of the soil to get wet and weedy, and herein consist the principal advantages of the system, as well as in the fact that rolling ground can be irrigated thus without being previously leveled and without being cut up with open ditches. The difficulty of keeping the holes open and of preventing the roots of the vines from entering the pipes is, I understand, very great and probably impossible to overcome. Both irrigation water and liquid manures could by this system be supplied to the roots of the vines directly without any waste, and, in cases of diseases or attacks by underground pests, medicines or insecticides could be brought to the soil with the least possible cost.

The natural subirrigation is caused either by the whole soil filling up with water from the natural and original water level to the very top or to the roots of the vines, or from an impervious hardpan or clay, as subsoil, up towards the surface. As an example of the former we might cite the country around the irrigated plains of the San Joaquin valley, especially around Fresno and in Mussel Slough. Before irrigation was begun there in 1872, the surface water was from sixty to seventy feet from the top east of the railroad, and from forty to fifty feet west of the railroad, lower down in the valley. After five years of irrigation it began to be noticed that the soil required less water. The water in the wells began to rise, and the following year the water stood in many places near or on the top of the surface. Now the whole irrigated district around Fresno has filled up with water to such an extent that drainage ditches have become necessary in some places in order to lower the water in the wet season some four or five feet from the surface. Many more drainage ditches will be required, as in wet winters the surface water in places is not only very near the top, but actually forms ponds or swamps where formerly the ground was entirely dry.

In the old irrigated districts, water can now be found at from six to ten feet in the driest season, while formerly the wells had to be from fifty to seventy feet deep. In the older vineyards, and even in many of the younger ones, no more surface irrigation is used; all that is now required is to allow the water to run in the main ditches, in which the water sinks sufficiently to keep up the supply of the evaporation of the ground outside. Large tracts of land which have never been surface irrigated are now sufficiently moist to grow vines to the greatest perfection, and many of the best vineyards have never been irrigated at all; in fact, nothing but drainage ditches have ever been made on the land. Whenever such subirrigation exists, the water level will be found higher in the winter than in the summer, and drainage should accompany subirrigation in nearly every instance. A subirrigation like the above exists in Denia and other of the Spanish districts. Subirrigation may be also caused by either impervious subsoils, such as hardpan and clay, or by spongy subsoils, which keep the water like a sponge. Such is the case to a limited extent in parts of San Bernardino county. At Redlands, for instance, much less irrigation is now used than when the vines were first planted, and this fact is attributed to a spongy subsoil peculiarly retentive of water. A similar subirrigation exists in the Mussel Slough country, where the water rapidly fills the land and keeps it moist throughout the summer. The phenomenal moisture of the El Cajon land is probably also produced by some kind of subirrigation, either on impervious or through retentive strata; the waste water from the surrounding hills no doubt supplies much of the water appearing in the lower lands of the valley. Other valleys close by do not show this moisture, the underlying strata probably making subirrigation impossible with the present amount of rainfall.

Seepage.—Seepage is the quality of the soil to attract moisture and retain it. Seepage soils attract the water from a ditch run through the land, the water spreading all through the soil towards all sides instead of sinking only vertically down. There is a distinct difference between such seepage soils and those that do not seep, although there is a gradation in the degree of the seepage, some soils seeping more than others. Thus the Fresno soil, or the soils on the Fresno plains, especially the red and sandy soils, do not seep or percolate. Vines planted on the sides of the ditches, or a foot or two from their banks, will die and dry up if not specially irrigated by bringing water to their very roots. Other soils, especially the river-bottom soils or the alluvial soils, seep or percolate in a great or less degree. They act like a sponge, attract water and give it away slowly, and the soil will be found wet for long distances from the ditch. This seepage capacity of the soil is partly caused by an abundance of humus or vegetable matter. The seepage capacity of the soil greatly increases by admixtures of green vegetable matters through the plowing under of green crops, such as alfalfa, peas, beans, grain, etc. The value of seepage soils is seen especially where some uneven ground is scraped off and the top soil removed to low places. Such ground often becomes useless for years afterwards, especially if the quantity of humus in the lower soils is small. Frequent irrigations will not serve to keep such soils moist, as the water sinks rapidly down, leaving the poor top soil dry. Vines planted in such places never do well, and even heavy manuring will not suffice to bring on a strong, healthy growth. Such humus-wanting soils must be treated with green crops, as stated above, in order to become fertile and moist. Thus seepage and subirrigation are often confounded. The former is caused by the retentive and communicative quality of the soil, while the latter is caused by the natural or artificial distribution of the underground water.

Subirrigation and seepage combined make the most perfect irrigation for a raisin vineyard, with advantages that can in no other way be



Raisin-grape Picking at Riverside.

attained: absence of distribution ditches, which take up valuable land and which cost money to keep clean from weeds; less growth of weeds on the surface of the ground; greater mellowness of the top soil and less work in plowing generally; a greater and more uniform supply of moisture, which, instead of being near the top of the ground, is accumulated deeper down, thus causing the roots to go down instead of spreading near the surface; no expensive irrigation, which will require plowing every time after the water is spread on the surface; a greater coolness of the ground and a lower temperature generally, which shows itself in a more vigorous growth of the vines, a greater supply of grapes and less danger from sunburn. These and many more are the advantages of subirrigation and seepage combined. To attain them in a raisin vineyard, no labor and reasonable cost should be spared.

Drainage.—Drainage is necessary in all vineyards where large quantities of water are used for irrigation, and principally at the very time that subirrigation begins. Thus in Fresno county the best raisin vineyards are those in which the land is both subirrigated and drained. When irrigation commences in any certain district, no one thinks of drainage as a possibility, and great carelessness is shown in locating ditches and other irrigation works. But in a few years, when the soil is full of water which finds no outlet, drainage becomes both necessary and desirable. A very successful and highly necessary drain has been constructed through a part of the Fresno district, which so filled up with water during the rainy winter of 1883–84 that much of the ground could not be plowed until late in the spring. The drain remedied the evil and drained the soil, and the vineyards grown there are now counted among the best and most profitable. The water thus drained off lowered the water level from six to seven feet. In very dry seasons this ditch is filled with water, and serves then to keep the soil moist through seepage or subirrigation.

The Influence of Irrigation on the Soil.—It is by many considered that irrigation helps to fertilize the soil. The spring and flood water contain great quantities of mud and humus, which when spread over the land will greatly increase its fertility. Even ordinary river water contains salts and other ingredients, which will fertilize the soil to no small degree. Another cause of the increased fertility of subirrigated soils is that the water which constantly evaporates carries with it salts, etc., from the lower strata up towards the surface, and makes them accessible to the roots of the vines. But, on the other hand, if the water or the soils contain alkalies or other destructive substances, these also are deposited on the surface to the great detriment of the vines, and often to such an extent that the vines will die or become sickly. Too abundant flooding may also leach out of the soil its soluble salts, and carry them deeper down in the ground. But if this soil after a while fills up with water and becomes subirrigated, the evaporation of water from the surface will gradually carry these salts back to the surface, when they will increase the fertility of the soil. Where drainage is very perfect, constant irrigation will gradually rob the soil of many of its soluble salts, and carry them to places where they will forever be out of the reach of the vines. To ascertain these facts and conditions, every vineyardist should have the soil analyzed about every five years, and too great care cannot be taken to keep the soil of proper strength.

Another influence of irrigation on the soil may also be mentioned here. Some of the soils in the irrigated districts which were formerly very hard and difficult to work have in course of time changed and become mellow. The water has undoubtedly caused a chemical and mechanical decomposition of the components of the soil, which has caused it to continually improve. Even certain kinds of hardpan have been known to dissolve when irrigated, and to change into useful and mellow soil, in which the vines can find nutriment. Such hardpans are those which are generally found in very dark red soils; those in lighter soils are not so readily dissolved.

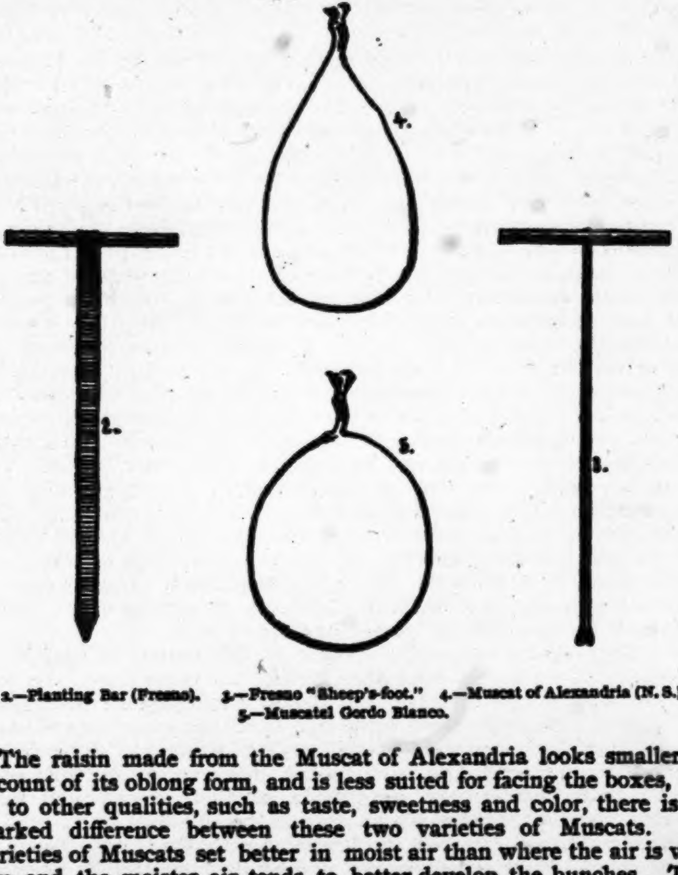
THE RAISIN GRAPES.

Introductory Notes.—The raisin grapes might be divided into two classes,—proper and genuine, such as Muscats, Sultanas and Currants, and irregular or inferior raisin grapes, such as Malagas and Feher Szagos. Now-a-days almost any kind of grapes are dried and sometimes called raisins, but the proper name for them should be dried grapes. With these we need not here busy ourselves, as with a few exceptions they are of little value, and cannot be compared with the regular raisin grapes, either as regards quality, demand or price.

Muscatel or Gordo Blanco.—This variety is the best type of the raisin grape of Malaga. Its growth is low and spreading, with no upright branches in the center. Its bunches are heavy, and, when perfect, close and shouldered. Its berries are round and large, the greatest circumference being at the center. A crease is often found at the apex of the berry. The color is green, or, when fully ripe, amber green or yellow. As compared with the Muscat of Alexandria, this variety is distinguished, when perfect, by its low, depressed growth, without any upright branches in the center of the vine; by a closer bunch; by rounder berries, and by a thicker and firmer bloom. The berries set better than those of the Muscat of Alexandria, although both varieties suffer from the early stages of oidium or colure. The Gordo Blanco is the choice raisin grape for the San Joaquin valley, and for the interior generally. It is the raisin grape of Malaga in Spain, where it is probable the variety originated. Importations of this variety have been made to California at various times by A. Haraszthy in 1861, and by W. S. Chapman in 1876.

Muscat of Alexandria.—The growth of this variety is upright in the center. Its clusters, even when perfect, are never close. Its berries are oblong and tapering, the largest circumference being near the apex. The color when fully ripe is amber green or yellowish green. The leaves of both varieties of Muscats are five-pointed, light green, lighter below, and do not differ materially from each other. Both Muscats are remarkable for their second and third growths, and for the large second crop on the laterals.

The Muscat of Alexandria, as compared with the Gordo Blanco, is characterized by its oblong berries, and by its more upright branches in the center of the vine. Its growth is more straggling than that of the Gordo Blanco, and, planted side by side, the two varieties are distinctly characteristic. The Muscat of Alexandria is the favorite raisin grape in Southern California, where it seems eminently adapted. I found no other Muscat in San Bernardino and San Diego counties. The most magnificent bunches of this variety which I have ever seen were grown there only a few miles from the ocean,—bunches that could not be surpassed, and which certainly were equal in weight to any Gordo Blanco that have ever come under my notice. A. B. Butler considers that the Muscat of Alexandria does equally as well as the Gordo Blanco in Fresno, but most growers are not ready to agree with him.



2.—Planting Bar (Fresno). 3.—Fresno "Sheep's-foot." 4.—Muscat of Alexandria (N. S.).
5.—Muscatel Gordo Blanco.

The raisin made from the Muscat of Alexandria looks smaller on account of its oblong form, and is less suited for facing the boxes, but as to other qualities, such as taste, sweetness and color, there is no marked difference between these two varieties of Muscats. All varieties of Muscats set better in moist air than where the air is very dry, and the moister air tends to better develop the bunches. This explains why, in isolated vineyards in the interior, the bunches are never so large as where a large number of acres of vines have modified the often excessive dryness of the atmosphere. As to the relative distribution of these two varieties of Muscats in our State, it may be stated that the former is not based upon any particular adaptability of the respective varieties to the localities where they are grown. The Muscat of Alexandria is the older variety of the two, probably both in Spain as well as in California. To Valencia in Spain it was brought by the Moors from Africa, or possibly from Alexandria in Egypt. The Gordo Blanco again appears to be a native Spanish variety, especially adapted to the warmer region of Malaga or Southern Spain. The Gordo Blanco is the principal grape of Malaga; the Muscat of Alexandria is the one grown in Valencia and Denia and also in Smyrna in Asia Minor.

In California the Gordo Blanco is found around Woodland in Yolo county, throughout the San Joaquin valley, and in Fresno it is the favorite and almost exclusive Muscat grape. The Muscat of Alexandria is grown in Solano county and elsewhere in Northern California, while it is the exclusive grape in Riverside, Redlands, Orange county and El Cajon, and probably elsewhere in San Diego county or Southern California generally. The Muscat of Alexandria was imported by Colonel Agoston Haraszthy in 1852 from Malaga, and by D. M. Delmas some thirty-eight years ago from France.

Huasco Muscat.—This variety (pronounced Uasco) resembles very much the Muscat of Alexandria, of which it is probably a seedling, and was introduced into Chile by the Spaniards soon after the conquest. According to Professor E. W. Hilgard, this variety sets better than the Alexandria, and on that account deserves to be cultivated. It is strange that no attempts have been made in this country to grow it on a larger scale. The Huasco is undoubtedly one of the most interesting grapes, and the fact that it produces the most expensive raisins in the world should be a sufficient inducement to our California growers to at least study the variety closely. I should think that El Cajon valley would be the proper locality for it in this State.

Other Varieties of Muscats.—A variety of Muscatel resembling the Gordo Blanco, but with more erect growth, is said to have been imported by G. G. Briggs of Davisville, Solano county. I have seen it growing in the vineyard of George A. Freeman of Fresno, but cannot distinguish its berries from those of the Gordo Blanco. The growth of the vine is more erect, and leaves the center of the vine rather uncovered and exposed. I would decidedly prefer the Gordo Blanco. A seedling of the Gordo Blanco originated by the author is now growing on the Floreal vineyard, owned by J. T. Goodman, near Fresno. This variety promised a great deal the first season. I have no doubt that, with some selection of berries and bunches, many new and valuable raisin grapes could be originated in this State, varieties which would be especially adapted to our soil and climate. While our fruitgrowers have produced a number of new fruits of various kinds, we have yet to hear of the first superior grape seedlings. According to the *Rural Press* of May 5, 1877, C. T. Ward of Haywards, Alameda county, raised some seedlings from Huasco seed, but what has become of them I do not know. Haywards would not be likely to be a proper place for raisin grapes, and even the best variety could not possibly be a success there.

J. T. Goodman of Fresno has a Muscatel vine in his vineyard which ripens ten days earlier than the Gordo Blanco, but whether it is a seedling is not known. It may prove a most valuable variety if extensively grown. B. G. Stabler of Yuba City tells me that Ch. E.

Swezy, near Marysville, has raised a seedling from an imported Dehesa raisin, which in size, flavor and all other qualities excels any other table grape known, but the flavor of the grape does not resemble that of the Muscatel. I have seen raisins made from this grape, but they were not desirable; but as a table grape this variety is said to be superior. If so, this grape should be tried in different localities, and may prove a real acquisition. There is no doubt that other seedling raisin grapes have been raised in this State, and we hope in course of time to know all about them.

Seedless Sultana.—This grape is decidedly one of the most important raisin grapes known. Its bunches are very large, sometimes weighing five pounds each. The berries are round and seedless, the size of large peas, of a green color, which, when the grape ripens, turns bright amber yellow, with small brown spots. The leaves are large and very entire, and more yellowish than those of the Muscat. The growth of the vine is upright, with erect or climbing branches. This grapevine in order to bear must be pruned long, and should properly be staked from four to five feet high. The yield of the Sultana is very heavy, and as much as sixteen tons of fresh grapes are frequently harvested from an acre, provided the soil is the very best possible. The grapes begin to color and sweeten several weeks before the Muscat, but they become fully ripe later than this variety, and are on that account not as extensively grown as they certainly deserve to be. For districts with long summers and autumns the Sultana will prove a very profitable and desirable grape. The native home of the Sultana is Asia Minor. There it is grown principally around Smyrna and in several of the islands in the Archipelago. In California only few Sultana vineyards are planted; still there is undoubtedly a great field for this grape where the seasons are long enough to allow of its perfect ripening. The raisins are light in color and somewhat acid, but with no particular flavor, and in this respect are inferior to the Muscats and the Currants. They are produced either by dipping, as is done in Smyrna, or by sun-drying, as we do in this State. If the dipping process is used, the grapes must be very ripe, else they will turn reddish and dark and lose quality. In California the Sultana grape does well, and only seldom produces seeds. In Eastern Mediterranean countries, except in the few favored spots of Smyrna, or in some of the Islands, this variety rapidly deteriorates and becomes seed-bearing, which of course entirely ruins its usefulness. The Seedless Sultana was first brought to California by Colonel Agoston Haraszthy in 1861.

Black Currant.—This variety is but little known in this State. The growth is erect and climbing. The bunches are long, narrow and cylindrical, with heavy shoulders. The berries are small, of the size of peas, seedless and black, very sweet and with a peculiar aroma not found in any other variety. The Black Currant should be pruned short, and the young branches require staking in order to bear well. The home of the Black Currant is the Grecian Islands as well as Morea, especially around Patras. Zante, Cephalonia and Ithaca all produce Currants of the highest quality.

Other Varieties of Currants.—The White Currant grown in California is not the true raisin grape which produces the Currant of commerce. The bunch and berry resemble the Black Currant, but differ in not being black, and in lacking the peculiar aroma and flavor alone possessed by the Black and true Currant. There are in Greece several other varieties of Currants, such as red and gray, but these are used for wine and not for raisins. The White and Red Currants were introduced from Crimea in 1861 by Colonel Agoston Haraszthy.

Thompson Seedless.—This variety has been growing in California for many years, but has only lately come into notice. It was imported from Rochester, New York, from the establishment of Elwanger & Barry, about 1872, and was by them described as a grape from Constantinople under the name of Lady Decoverly. Thompson Seedless is the name given this grape by the local growers around Yuba City, and not the original name. I am inclined to believe that this grape is related to, but not identical with, the oblong, seedless grape which is grown around Damascus in Asia Minor, and there dried into a raisin of very good quality. This Damascus grape is brownish when ripe. Thompson Seedless is an oval grape, greenish yellow, as large as a Sultana, seedless, with thin skin, good but not strong flavor, and without that acid which characterizes the Sultana grape and raisin. The bunches are large, or very large, and the vine is an enormous bearer. As yet it is principally grown around Yuba City and Marysville in limited quantities, but the raisins are in good demand. When sun-dried and cured, these raisins are bluish and dark like Muscats, but narrower and more tapering, and only a quarter the size. Their sweetness and taste commend them for cooking purposes, and the bearing quality of the vine will no doubt make their growing profitable in all places where the seasons are too short to thoroughly ripen the Sultana. In Yuba this grape ripens early in August.

Other Seedless Grapes.—In the Islands of Lipari and Pantelleria a coarse but seedless grape is grown, out of which a variety of Sultana raisin is made. We have no further notices and description of this variety.

Malaga.—This is not a real raisin grape, but of late years raisins have been made from it and found both fair in quality and profitable to the grower. The Malaga is a heavy bearer of one crop of very large but loose bunches. There is no second crop. The berries are large, oval, not tapering, the flesh is meaty and solid, very sweet, but with no decided flavor. The skin is thick and green, when ripe amber yellow, with thick bloom. Raisins made of this grape are very large, and the bunches are also large and solid, and the berries are not easily torn off. When sweated, the skin becomes thinner, and the quality improves generally. The Malaga is a very hardy vine, not particular about soil, a strong grower, bears well, and its grapes ripen at the time of the Muscats. But, as there is no second crop, the vintage of the Malaga will be over long before that of the Muscats, and out of the way of rain or fog. This is what makes this grape so valuable. Four cents per pound has been paid for these raisins in sweatboxes for the past two years, and at that price this grape pays better than the Muscats. The Malaga raisins are also very heavy and solid. I am satisfied that there will be a good demand for this raisin, especially among consumers, who prefer a bunch raisin, but who do not care to pay for the expensive packing which is necessary to preserve the Muscat bunches. The Malaga raisin could be sold in bulk, and still would not break up. The Malaga grape is grown in many places in California, and is used principally as a table grape; it has only been cured and dried into raisins in Fresno. According to A. B. Butler, this grape is grown in Malaga for table purposes.

Feher Szagos.—Feher Szagos raisins have been in the market for several years, and have brought in sweatboxes from three to three and a half cents per pound. This grape is a heavy bearer and grower, branches erect but slender, leaves glossy, entire, bunches medium to small, pointed and solid. The berries are greenish amber, medium, oval, pointed, with thin skin, and few and small seeds. The flesh is not firm, but dries well, and when dried the raisin is very good, with a peculiar flavor of its own. They are only used for cooking, but are nevertheless rather good raisins to eat, and their seeds are so soft that they are not objectionable. The bearing quality of the Feher Szagos is very heavy, as much as sixteen tons of green grapes having been raised to the acre, and from ten to twelve tons is a common yield. It ripens with the Muscat, and the vine bears only one crop. At three cents per pound, the Feher Szagos is a profitable grape. The native home of this variety is Hungary or Southern Austria, the name meaning, in Hungarian, White Jack. In Fresno it is grown quite extensively, having originally been planted as a wine grape. As such it is highly valued, producing an abundance of highly flavored sherry.

Other Raisin Grapes.—In Asia Minor, the Grecian Islands, Morea, Italy, Spain and Morocco, there are grown a number of varieties of grapes which are cured into raisins and sold as such. Many of these are little, if any, better than our dried grapes, while others again are superior, more resembling the regular raisins. Among the latter we have the Spanish Black and Red, and the Smyrna and Turkish Black and Red. Some of them belong to the Muscat family, probably resembling Black and Red Muscats, but of these varieties we have no particular information, and our growers will probably not lose much by avoiding a more intimate acquaintance with them.

DISEASES AND INSECT PESTS.

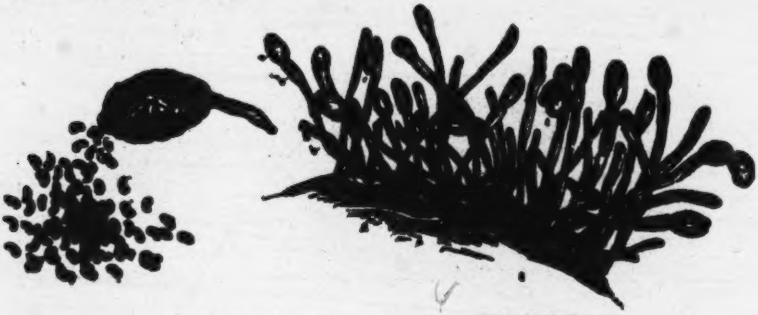
The following short account of the diseases and insect pests is not intended to be exhaustive, and is only intended to refer to the raisin districts of our State. I have not included accounts of the phylloxera nor of other insects or fungi which do not exist in these districts, but which may be troublesome in other parts of the State. Strictly scientific descriptions have purposely been left out, but I have endeavored to make the popular account as correct and as condensed as possible. Of insects and fungi I have only enumerated those which are of importance through the damage they occasion from time to time. Those which prey on the vines, but which cause no great damage, and which the grower need not prepare himself to fight, have here been left out.

POWDERY MILDEW OR UNCINULA.

General Notes.—This disease of the grapevine is caused by the growth of parasitic fungus known in Europe as *Oidium Tuckeri*, and in this country as *Uncinula spiralis* or powdery mildew. I am satisfied the two names signify the same fungus, only the European form has never been found as highly developed as the American one, which has on that account received a name of its own. If the two are identical, then the European Oidium, which for many years caused the destruction of the transatlantic vineyards, was imported to that country from this. The *Uncinula spiralis* is undoubtedly native on our indigenous vines.

Characteristics.—The mildew appears in two different stages, one in the spring when the vines are in blossom, the other again later in the summer when the fruit is more advanced. The first stage of the mildew resembles a fine cobweb spun between the flowers of the bunch. If allowed unrestricted sway, the flowers will drop off, the fruit will never set, or set only imperfectly, and the crop will be a great loss or even a total failure. Generally the inexperienced vineyardist does not perceive the mildew until too late. A slight touch to the vine will then bring down all the young fruit or blossoms like a shower, and the stem of the bunch will be seen to be entirely bare, or with only a few scattered berries. This form of the Uncinula mildew has not been as scientifically investigated as would be desirable, and nothing is known as regards its development. It is possibly a primary generation and early stage of the later Uncinula. I believe this form of the mildew is identical with the disease which is called Colure by the French, and which is characterized by the dropping of the young, undeveloped grapes. The first appearance of this mildew is always accompanied by white, salty excrescences on the edges of the grape leaves. Whether they are directly or indirectly connected with the fungus is not known.

The later form, the powdery mildew, and the form which has given this mildew its name, appears later in the season, when the grapes are half grown or more. It then takes the shape of fine powder-like patches or blotches on the upper side of the leaves, stems or berries. These spots are of a dull gray or whitish gray color, and smell strongly of mold or mushrooms. If these mildew spots when young are rubbed smooth, especially on the green stems or berries, we see below them, in the epidermis of the vine, the *mycelium* or stem of the fungus spreading in all directions from a central point, like the roots of a tree or plant. This part of the mildew corresponds with the stem and root of a plant, while the upper, powdery part is the one which produces the spores or the seed, conidia and peritheca, all of which are reproductive organs. The grapes thus attacked gradually dry up or crack open. The leaves are eaten through and dry up, and the whole plant becomes badly diseased, and may even die.



Powdery Mildew (Oidium Form), Greatly Magnified.

History and Distribution.—The powdery mildew or Oidium was observed for the first time in the year 1845 in hothouses in England. It immediately began to spread, and in a few years infested all the vine districts of the Old World. Before any remedy had been discovered, many vine districts were so injured that they have not since been able to recover. Thus in 1850 and 1851 France suffered greatly from this mildew, and the Island of Madeira, which for three hundred years had produced the finest wines, had its grapevines so injured that they up to this time have not again produced as good a quality of grapes as before the advent of the disease. The Grecian Islands as well as Morea were also visited by the powdery mildew, and though the latter is now kept in control, the general opinion is that the quality of the currants is not as high as it was before the mildew appeared. Now there is probably no place in the Old World where grapes are not attacked by this mildew, although some places are injured much more than others. Adjoining vineyards are often differently attacked, some being even entirely free, while others are visited yearly. Young vines are less attacked than old ones, and in favorable places the mildew seldom infests vines before they are two or three years old. Elevated places and localities exposed to winds and cold are generally attacked by the first stages of this oidium, while its second or last stage prefers low, damp places exposed to dew or fog.

The American form of the powdery mildew or *Uncinula spiralis* differs in some respects from the European Oidium, not as to its effects, but as to its microscopical characteristics. The Oidium occurs in Europe only with certain generative organs called gonidia, while the American

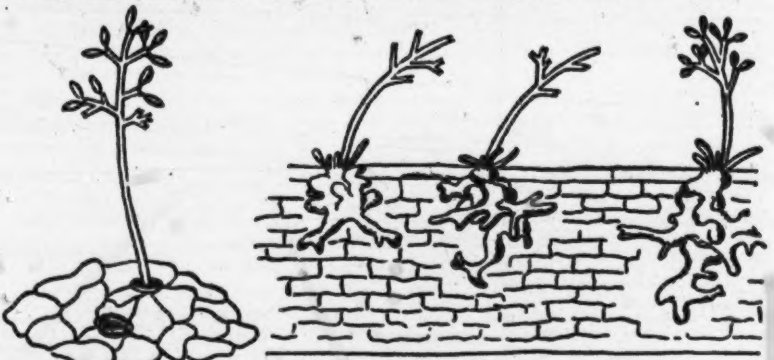
Uncinula also develops so-called *peritheca*. It is more than probable that both fungi belong to the same species, but until these perithecal organs have been found on the European Oidium, the proper name for our mildew must be *Uncinula*, and not Oidium. It is also probable that the *Uncinula* fungus is a native of this continent, and that it from here has spread to Europe, where the natural conditions are such that only the gonidial form of the fungus has been able to develop. In general appearance and in their effects the *Uncinula* and Oidium are identical.

The Oidium appears sooner on poor soil and on exhausted vines, and vines in which the flow of the sap for some reason or other has been checked are more subject to the mildew than those which are yet in full growing vigor. Elevated vines on trellises which are much exposed, and vines which are so covered up that the air has little access, are the first ones to be attacked, and those which will suffer the most. The powdery mildew affects all varieties of grapes, but some kinds more than others. The Muscats are among those which suffer considerably, and if not sulphured would in severe cases neither set nor bear suitable grapes. The Malaga is less affected, and so is the Sultana. In new districts the Uncinula does not appear until the vines are older. Thus in the Fresno district the earliest vines did not suffer from mildew until they became five years old, but now the mildew would destroy the grapes every year, in case they were not treated with sulphur.

Remedies.—The most common and perhaps the best remedy is powdered sulphur. The latter is applied either with the dust can or "dredger," or with bellows. The dust can is used when the vines or vine shoots are yet small, and the bellows when the vines are larger. The first sulphuring should be done when the young shoots are six inches long, immediately before the bloom, and the second time when the berries are well set. Sulphuring as a regular vineyard operation will be more fully discussed further on.

DOWNY MILDEW OR PERONOSPORA.

General Notes.—The downy mildew is a fungus known botanically as *Peronospora viticola*. Its native country is the United States, but its greatest damage is done in Europe. It appears as white, downy spots on the underside of the grape leaves, which are gradually destroyed, and later on attacks the berries, which shrivel and spoil. In California the downy mildew occurs frequently on wild native grapevines, but only very rarely on the cultivated Asiatic vines. Dr. H. W. Harkness, the eminent mycologist, found it only once on cultivated vines in the Sacramento river bottom. These vines were growing close to native vines, from which the fungus had spread. There is no fear that this fungus will ever spread and cause damage in our State as long as the vineyards are given plenty of air. In France the *Peronospora* has caused much damage, but is now being combated with bluestone and lime solutions, according to the following formula: Slake thirty pounds of lime in seven and a half gallons of water, also mix sixteen pounds of bluestone (copper sulphate) in twenty-five gallons of water. Mix the two together, and either sprinkle the foliage with it, or dilute it further with say five hundred gallons of water and spray the vine leaves on both the upper and lower sides. According to Dr. Harkness the efficiency of this spray cannot always be relied on. So far no other fungi have appeared in the raisin districts of this State, nor have we reason to fear that any will attack the vines.



Downy Mildew (*Peronospora*), Greatly Magnified. *a*. The Fungus Growing out of a Stoma of the Vine Leaf. *c*. Transversal Section of Vine Leaf, showing Fungi and its Tuberous Mycelium.

THE VINE PLAGUE.

Characteristics.—The first, or at least the most characteristic signs of this disease appear especially after a summer rain, or after the first fall rain. The leaves then become spotted with yellow. The following season these yellow spots appear as if fused together, and many leaves become entirely yellow, except the veins, which stand out bright green. Some leaves are invaded by the yellow from the edges, while the veins as before remain green. These yellow spots soon turn brown, the leaves dry up and curl slightly backwards and finally fall off, leaving the canes bare. During the very first appearance of the vine plague, many leaves turn brown and dry up in certain spots in the vineyard without the previous appearance of any yellow spots. The drying of the leaves proceeds either from the center of the spots, or from the margin of the leaves, destroying both the leaves and their veins. Later on in the fall a new crop of leaves appear, but these leaves are small or very small, bright green and sickly, and do not continue to develop after they have reached a certain size, different in different vines. In red varieties of grapes, the yellow spots in the leaves gradually turn red or claret colored, often resembling the most beautiful autumn leaves. In districts where the disease is common, these leaves are generally known as calico leaves on account of their peculiar markings.

The canes do not attain their regular growth; and fail to mature in the fall, or mature only in spots, the balance of the wood remaining dull green. The inner parts of the canes are, as a rule, more mature than the tips. Very often only one or two joints nearest the stem mature, and in bad cases no part of the canes mature, but at the advent of the rain turn black and die. Late in the fall the tips of the green canes turn black, dry up and snap off like glass when touched. The pith turns in the older canes dark brown, dries up prematurely and dies, while in very young canes the pith remains watery like a semi-transparent jelly.

Many vines have no mature wood when the leaves have fallen in the autumn, while others again have some. While the spotted leaves may appear all over the vineyard, the diseased canes appear on vines in spots, these spots in the vineyard growing larger year after year. A dead vine may be seen in the midst of healthy ones, while a healthy vine, on the other hand, may remain in the midst of dead ones. It takes generally several years to kill the vines, and some varieties are hardier than others. Some Muscats may succumb in one year, while some will last for three years or more. The roots remain alive and healthy longer than any other part, and, when the top of the vine has already died, it is common to see the root send up a healthy sucker, which, however, in its turn, will become diseased and die. It is likely that the vines in some districts will suffer more than in others, and in places the vines may not become seriously injured by the disease.

The berries on badly diseased vines do not develop, but shrivel up or remain sour, and in some cases dry up entirely. In others, again, they acquire a mawkish taste, lose flavor and sweetness, and make only inferior or bad raisins. These many different characteristics of the plague depend evidently on the stage of infection. They do not follow each other in any certain succession, nor do they all appear on the same vine. Some vines show one face of the disease, other vines show another, and the observer must have been previously acquainted with the disease before he can readily recognize it.

Nature and Cause.—The cause of the vine plague is not known. No deadly fungus has so far been found on the vine, nor has any other deadly parasite been found on the diseased vines. In California the vine plague has been studied by N. B. Pierce, of the Agricultural Department at Washington. He suggested once that the disease was of bacterial nature, but has not proved his theory, his investigations not yet being finished. Mr. E. Dowlen has also been investigating this disease, and at one time thought it caused by a fungus, which, however, was proved later by Dr. H. W. Harkness to belong to the non-injurious kind. No insects of any kind prey on the vines in sufficient numbers to cause the serious symptoms of the vine plague.* Whatever may be the true cause of the vine plague, certain it is that it resembles in its advent and spreading such diseases in men as cholera, yellow fever or the Oriental plague. The vine plague appears to be especially promoted by warm, moist air and rain, but it is not confined to damp places, nor has it as yet been ascertained in what relation it stands to locality and climate.

---

*The most interesting and correct account of the vine plague yet published is found in an essay on "The Mysterious Vine Disease," by Newton B. Pierce, read before the State Horticultural Convention, at Los Angeles, March, 1890, and published in CALIFORNIA—A JOURNAL OF RURAL INDUSTRY, May 10, 1890; Vol. 3, No. 18.

In California it first made its general appearance in Anaheim in Orange county, in the month of August, 1884, when vineyards of old Mission vines suddenly stopped growing, and the grapes failed to color and ripen, while many of the vines died the same year. The plague attacks in preference vines growing on poor, sandy or alkaline soil, or in vineyards underlaid with hardpan. The weak vines succumb the first of any. This is the reason why so many vineyardists doubt the existence of any particular disease, contributing the poor condition of the vineyard to anything else than the true cause.

N. B. Pierce, who has now spent a year in studying the vine plague, has found many similarities between it and the *mal nero* of Italy; but the descriptions of the foreign investigators are both contradictory and insufficient, and, without a personal investigation of the Italian or French vines, the identity of our vine plague with any foreign disease cannot be established. It is to be hoped that the United States Congress will make such investigations possible. At present we do not even know whether the vine plague is original in this country or whether it was imported from foreign countries. The general opinion in the first attacked district is that the disease was imported there with grapevines brought from Europe. So far I have not been able to ascertain when and by whom such vines were imported, but I am satisfied that in the course of time it will be found that foreign grapevines were imported to the vineyards where shortly afterwards this disease first appeared.

Damages.—The damages caused by the vine plague may be summed up as follows: The leaves turn spotted and yellow, finally dry up and fall off. The canes fail to mature, or mature only in spots. Later in the fall, they die from the tips, which turn black and become brittle. The berries either dry up or shrivel up, and fail to mature, or at any rate become mawkish or bitter. The yield becomes less and less every year, although, the first year that the vines are touched by the disease, the yield is often unusually large. In severe cases the vine dies in from one to three years, but a few may linger longer.

Remedies.—The vine plague has existed in this State for six or eight years, but as yet few, if any, efforts have been made to extinguish it, and only during the last year have any experiments been carried on. The solutions of bluestone and lime which many expected would prove beneficial to the vines attacked by the plague have, in my opinion, done little or no good. Spraying the vines when in full foliage with the I X L compound greatly benefits the vines, and proves a powerful stimulant and the best remedy yet employed.

LEAF-HOPPER (*Erythroneura comes*).

Characteristics.—This pernicious little pest is a bug which multiplies in enormous quantities and sucks the sap out of the vine leaves. Many use the name of thrips to denote this insect, but this is incorrect, as the thrips is an entirely different, much smaller, insect, which so far has never been injurious to the vines of this coast. In size the leaf-hopper is, at maturity, about one-tenth of an inch. In color it is yellowish white, with a few red spots. When the insect approaches maturity, it jumps, but the undeveloped insect or larva only crawls, principally on the underside of the vine leaves, where their cast-off skins can be seen in all stages and sizes. The eggs are laid in the veins of the leaves. The glossy globules which are always seen on leaves where the leaf-hopper is found are not the eggs, as has been supposed by many, but is only the vomit which, when irritated, the hopper throws out either as a defense, or because it desires to rid itself of an unnecessary burden. The leaf-hopper hatches at least two times, or possibly three times, during the summer. Many of the insects remain over during winter time. They feed on almost anything, such as *alfilerilla* (*Erodium*), etc., but are especially fond of the grapevines, and even in the early spring flock onto the young vine shoots, leaving the less desirable weeds. In some localities this insect is known variously as the white fly, the vine-hopper, or incorrectly as the thrips.

Damages.—The hopper punctures the leaves and causes them to dry up and fall, thus exposing the grapes to the hot sun. The excrement of the hoppers also covers the grapes largely, and spoils their appearance and keeping quality, at least as table grapes. It is principally the table grapes and wine grapes which are injured by this insect; the former are made unfit for shipment, and the latter do not color well when deprived of their leaves. If the grapevines are kept growing, the grapes are less injured, and some growers even contend that the hopper is advantageous, as it causes the leaves to fall and the grapes to mature.

Distribution.—It is not known whether the leaf-hopper is a native of California, and I hardly believe it is. It does not exist in Southern California, but in Northern California and in the San Joaquin valley it is common. In the grape districts of Southern California there is found another variety of leaf-hopper almost twice the size and of a brilliant green color, which only once appeared in such quantity as to do any damage at all. Generally it is quite rare. The *Erythroneura comes*, however, occurs in countless numbers, and often rises in clouds when the vines are approached. In some years it is less common than in others, and after having been plentiful for several years gradually diminishes in quantity, but never disappears entirely.

Remedies.—Pasturing the vineyards with sheep as soon as the grapes are picked is very beneficial. The sheep destroy both hoppers and leaves, and the following season always finds the hoppers greatly diminished in numbers. The sheep do no injury to low-pruned vines, and in Fresno many vineyardists pasture their vines regularly every year in October and November, or as soon as the grapes are picked and the vineyards are made accessible.

The gauze bell consists of a bell-shaped cover made of wire netting, large enough to cover the vine. The inside of the bell is sprayed with petroleum, and then turned over the vine. A shake is then given the vine, when many leaf-hoppers will fly up and stick in the petroleum. It will only pay to use this remedy on table grapes; for raisin grapes it is too expensive.

RED SPIDER.

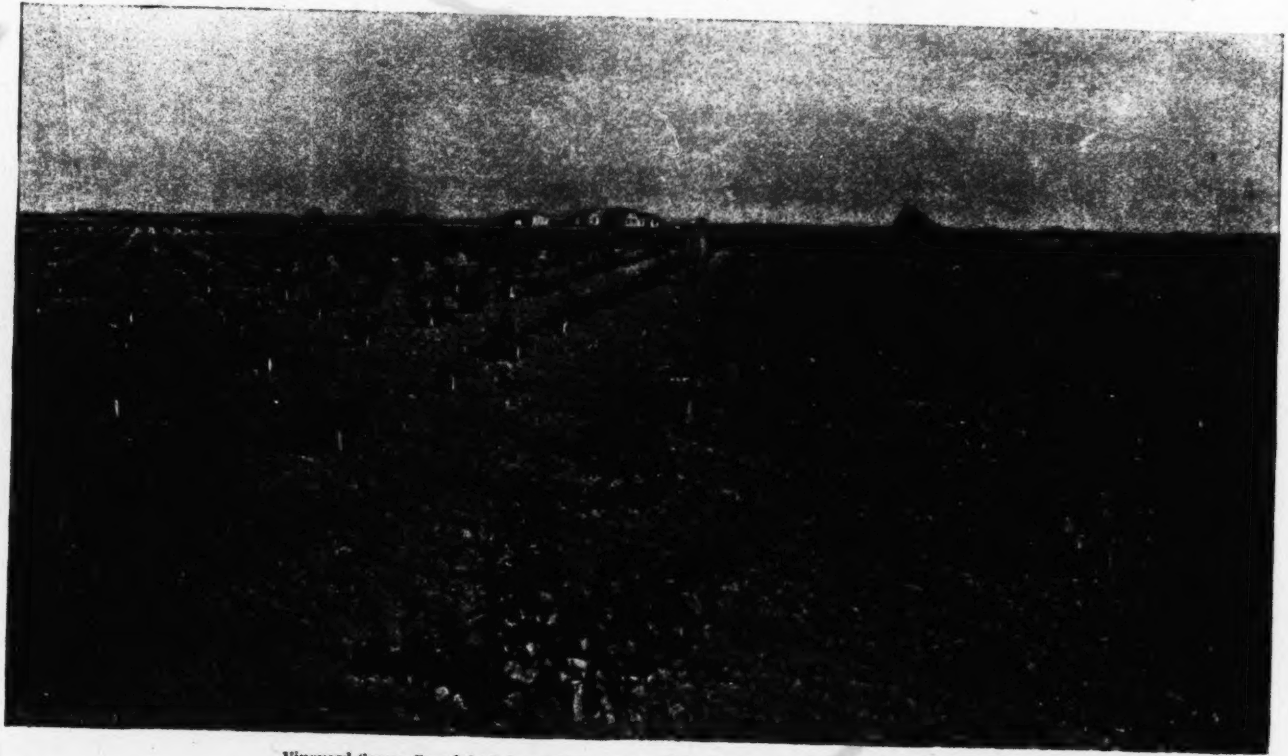
Characteristics.—Red or yellow mites are quite frequently injurious to grapevines. These mites are small, almost microscopical, and appear in enormous quantities on both sides of the leaves, especially, however, on their under side. They cover the leaves, and even the ground of the vineyard, with a thick cobweb, in which they live and hatch. Dry air and heat promote the wellbeing of the mites, and hasten the injury they do to the vine leaves, which soon dry up and check the growth of the vines. On the contrary, dew and moisture destroy the red mites in a short time, and in places near the coast they are seldom very injurious.

Remedies.—Sprays of various kinds, such as whale-oil soap, resin sprays, etc., have been used. Frequent spraying with pure water will destroy the mites, but they will multiply again if the climate is favorable. The best success is had with a spray of a compound known as the I X L compound, which is used in the proportion of five pounds of the compound to thirty gallons of water. One good spray will destroy both the mites and their eggs.

CATERPILLARS.

Characteristics.—The caterpillars which trouble the raisin grapes are confined to three or four kinds. The most common and also the most destructive are the very large larvæ of the sphinx moth. The common grapevine sphinx (*Philampelus achæmon*) is a large larva, incorrectly called a worm, which is, when full grown, over three inches long. The color varies from bluish green to brown, with several lighter stripes on each side. The head is truncate, and the tail is furnished with a curved horn. The *pupa* hibernates in the soil below the vines, and is about half the size of the full-grown caterpillar. The full-grown moth is about two inches long by two and one-half inches between the outstretched wings. The eggs are laid by the moths on the leaves of the vines. Two broods of caterpillars appear yearly under favorable conditions, or else only one brood, which generally appears in the end of July. The caterpillars grow with great rapidity, and attain their full size in a few weeks. The *pupæ* hibernate in the soil and hatch the following summer.

Another large grapevine caterpillar is the *Deilephila striata*, which is about the same size as the *Achæmon*. The moth has more pointed wings, with narrow stripes, and the larva is brighter colored, often yellowish green, with several colored stripes on the sides. The eggs are not laid on the vines, but on the weeds on the vacant lands outside the vineyard, especially on species of *Epilobium*, but also on other weeds, and they hatch and feed on them. The caterpillars feed in ordinary years only on the weeds on which they are bred, but in other years which are especially favorable to their enormous increase they migrate to the vineyards and feed on the vines at the most alarming rate. The caterpillars of both the above large moths vary in color from green to brown or violet brown, but as a rule the *Deilephila* is



Vineyard Scene, Rosedale Colony, Kern County, July, 1890.—Three Months After Planting.

more brightly colored than the *Achæmon*. The former is more active and often travels in enormous numbers, when it is called the army-worm. The *Achæmon* is more blunt at both extremities, the head being almost truncate.

Army-worms are smaller caterpillars, about one inch or more in length, which breed on the outside weeds, and which, when feed becomes scarce, migrate to the vineyards and feed on the vines. These caterpillars are the larvæ of smaller moths of various genera such as *Prodenia* and others.

Cutworms are other caterpillars of moths of the genus *Agrotis*, which feed on the branches of the vines, especially in the night-time, and in the daytime bury themselves in the soil beneath the vine. They are generally a gray or leathery color, while the army-worms are more violet and darker.

Damages.—The damages from these various caterpillars are sometimes very large. Some years they occur in enormous quantities, and hundreds of tons of them may then be picked from a vineyard of a hundred acres of vines. The leaves are eaten by them, and the grapes are either scalded by the sun or do not attain their sweetness and coloring. Sometimes these various caterpillars are very common and destructive for one or two years in succession, after which they disappear and do not return to trouble the vines again for many years.

Remedies.—The great caterpillars, after they have once infested the vineyard, can be destroyed by picking. A gang of men or boys should be furnished with buckets, which are besmeared on the inside with coal-oil. The caterpillars are picked and dropped in the buckets, from which they cannot crawl out, and when the buckets are half filled they may be emptied into trenches and covered up with soil.

Many use small scissors, with which the caterpillars are cut in twain while sitting on the vines. This will do for wine grapes, which are grown higher above the ground, but will hardly be proper on the low Muscat vines, as the contents of the caterpillars are apt to soil the grapes.

I have used Buhach sprays with great success. Ten pounds of Buhach, with a hundred gallons of water, brought the caterpillars down from the vines in forty-five minutes after spraying. As some, however, recovered, it is best to kill as many as possible of those which fall to the ground by punching them with a stick. The cost of Buhach is, however, great, and the difficulty of encountering favorable weather is such that this remedy is not apt to be extensively used.

When the vineyards are threatened by the invasion of the army-worms, or by the striped *Deilephila* caterpillar, the best remedy consists in trenching. A narrow trench, say one foot or more wide and two feet deep, with perpendicular sides, should immediately be dug around the vineyard. If water is at hand, fill the trench with water, on which some coal-oil may be poured,—enough to cause a film on the surface. If no water can be had, a log or scantling may be continually dragged up and down the furrow or trench, so as to crush the caterpillars before they can crawl out. In many places, however, the trench alone will do the work, as the caterpillars will generally not be able to get up the other side of the trench. What few crawl up can easily be kept down by hand-picking.

If certain attractive flowers, such as honey-suckles or petunias, are planted on a small bed in the vineyard, say near the house, the moths will come to them to feed from all the surrounding neighborhood. Only one small bed should be planted on every vineyard. A boy with a butterfly net, posted at each flower bed at sundown, can catch hundreds of moths every evening, and considerably reduce their number and prevent them from breeding.

BLACK-KNOT.

Characteristics.—The woody or spongy excrescences which appear on the vines, and which are known as black-knots, are really only a wart-like growth, the origin of which is entirely unknown. It is supposed that an insufficient outlet for the sap in the spring caused by too close pruning is the chief cause. Certainly closely pruned vines are more subject to the black-knot than long pruned vines, but on the other hand neglected vines which have had no cultivation, and which accordingly could hardly have had too rapid a flow of sap, suffer more than any others. The woody warts appear quite frequently on the ends of the spurs of the old wood, or on places of last year's growth which have been wounded or injured in some way, but never on the green wood. They vary in size from that of a pea to that of lumps weighing several pounds. When present in small quantities, the warts cause no injury, but when they become larger the vines may even die. These black-knots always die with the year, and never survive to the next season. At the end of the season, they burst open and then often display black spores of fungi, which, however, are only parasitical growths on the already decayed wood, and not the cause of the disease. As I said, it is generally supposed that the flow of sap is during spring time so great that it ruptures the cells of the vine and causes the warts to form. Under the microscope, however, there are no such ruptured cells visible. It is more natural to suppose, that through the accumulation of sap an irritating poison is originated, which causes the warty growth to form in a manner similar to the formation of galls. On sandy soil the black-knot is the most common, probably on account of the earliness and the natural warmth of this kind of soil.

Remedies.—So far no decidedly successful remedy has been found. Some growers advise leaving plenty of spurs on the vine, so as to give a sufficient outlet to the sap, but it remains to be seen if this will mitigate the evil. If the black-knot should be very destructive, a cutting out of the same in summer time while they are forming would be beneficial. This could best be done in June and July. Mixtures of coal-oil and lime, etc., have been used during the winter after the vines were already pruned, but, as the black-knot is then already dead, no advantages can result from this remedy.

GRASSHOPPERS.

General Notes.—While grasshoppers cannot be considered as a common pest in the vineyard, still they are at times greatly destructive.

There has been during the last sixteen years two such invasions of grasshoppers in the California raisin districts. The grasshoppers are of many species, some seventeen kinds having been recognized one season. They all breed in the waste or unplowed ground outside the vineyard, and when full-grown invade the vines. This fact can be taken advantage of to destroy them.

Remedies.—The waste lands for a half mile at least all around the vineyard should be plowed and harrowed in the early spring. This will destroy the eggs of the grasshoppers, and the fallow land will serve as a barrier over which the grasshoppers do not readily pass.

If the vineyards are so situated that the weeds or natural vegetation on the land surrounding the vines can be burned for half a mile or more, this will also prove a certain barrier for the hoppers.

A mixture of fifteen pounds of white arsenic with eighty pounds of bran and twenty pounds of middlings, moistened with enough water to make a paste, will be eaten by the grasshoppers. The paste is spread on bits of shakes or shingles and distributed all around the vineyard, and later on in the vineyard. It may also be smeared on fences or trees. The grasshoppers will eat it readily, and can thus be successfully destroyed. If this method is used in time, the advancing army of the pest can be kept back or destroyed at the very entrance of the vineyard. As another remedy, a spray is recommended consisting of one ounce of Paris green, one hundred gallons of water, and two pounds of paste. This is sprayed on the trees or vines, and is said to kill the grasshoppers effectively without injuring the fruit.

THE RAISIN VINEYARD.

PLANTING.

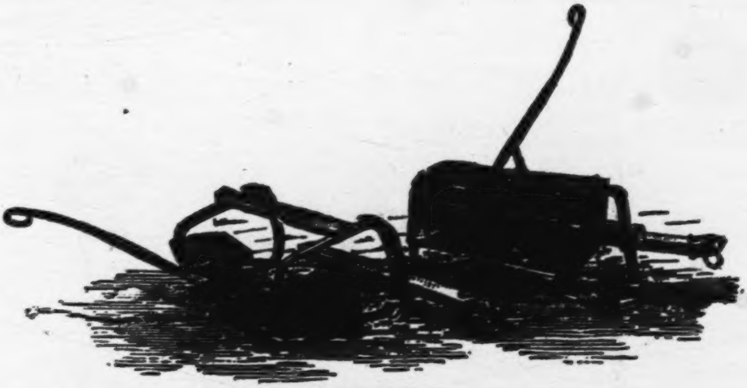
Distances for Muscat Vines.—An examination of the various vineyards in any or in all the different raisin districts will not help us much in deciding upon how far apart the vines should be set, as most vineyards have been planted by men of no previous experience in the raisin business, and when that experience was at last acquired the vineyards were already established and could not easily be changed. In planting, we are too apt to do as other people do without first inquiring from them if their experience has not taught them anything else, and if they would not do otherwise if they had to commence over again. For years the standard distances between raisin-vines have been eight by eight feet. Of late years this distance was considered too small, as our soil was supposed to be so rich, that all that was required, in order to get large crops, was to give the vines plenty of room. Many vineyards have been set nine by nine, nine by ten, ten by ten, or even ten by twelve and twelve by sixteen feet. The effect has, however, been different from that which was expected. Instead of producing larger crops, those vines which were given more room produced only more wood and more leaves. They followed that law of nature, which causes any animal or vegetable to grow luxuriantly when overfed, and which, on the contrary, causes seed and fruit to form when the vegetable system is restricted to certain proportions, which, of course, we can only determine by actual experience. By giving the vines less space, some inconvenience will be experienced in working the soil, and in drying the crop between the rows. On that account some vineyards have been planted with the vines closer one way than the other, thus giving plenty of room in which to work the soil, while on the other hand sufficiently confining the vines in order to cause them to bear well. I therefore now recommend that the vines be set four and a half by eleven, five by ten and a half, or five by eleven feet. The first would probably be my choice. I claim for this system many advantages, and beg intending growers to carefully consider the following points:

It gives us more vines to the acre, which means more grapes to the acre, as long as the land is of the best quality, and no raisin grapes should ever be planted on inferior soil, or at least the soil should be sufficiently rich to supply plant food to the greater number of vines.

It makes the working of the soil cheaper, and fully one-third more of the work can be done by two-horse plows. The single-horse work can be confined to plowing a furrow on each side of the vines, and to running a cultivator crosswise. As the number of rows in this system is less, it also follows that less single-team work is needed.

The vines protect themselves from the hot sun and hot winds which cause sunscald. The short distances should be in the direction of the hot wind, if any there be, or in the direction of east and west if there are no hot winds in the district. The spaces between the rows will thus catch the morning sun, which is of importance when we dry on trays between the vines.

Less roads will be needed in the vineyard, as the larger distance is sufficient to enable any teams to pass between every row of vines, and distribute trays, boxes, etc., without interfering with the vines. The saving thereby of labor in carrying the boxes and trays is quite an item in vineyards where the vines are planted say eight by eight feet or closer.

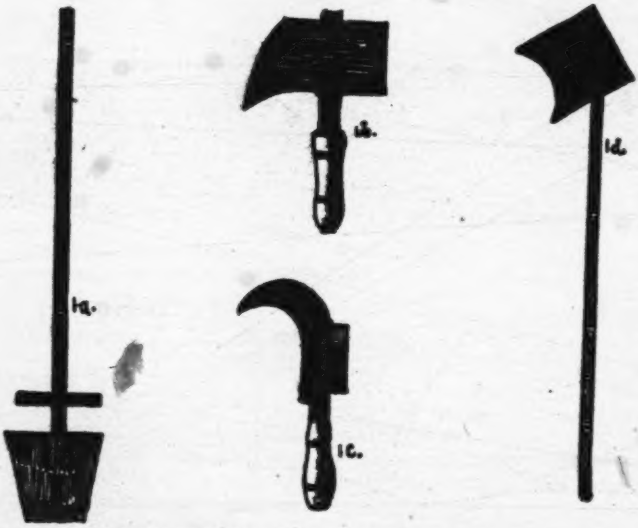


Land Scrapers.

The trimmings of the vines can be burned in the vineyard between the rows, and will thus help to fertilize the soil. Besides, the expense of hauling the trimmings away will be saved.

The Marking Out of a Vineyard.—As any practical horticulturist knows how to stake out an orchard or vineyard, a minute description is not here needed. I will only indicate the most important points. Cut a large number of small pegs, one inch or so square and a foot or so long. Next get two lines of twisted wire, each say 150 feet long. Mark off on one wire every five feet by inserting a small, bright copper wire in the twist, and wind it around the iron wire three or four times, enough to show the place. On the other wire mark off similarly every ten or eleven feet, always supposing these are the distances decided upon. Now stretch one of the wires along one end of the future vineyard and call this line the base line No. 1. Set a peg close to every copper ringlet, on the side of the wire away from the vineyard. When done, stretch the other wire, No. 2, at a right angle with the former, and set pegs similarly. Remove wire No. 1 from base line No. 1 and stretch it at the end of wire No. 2, parallel to the base line. Call this base line No. 2. Set pegs as before every eight feet. It is now evident that, by stretching successively the wire No. 2 between the pegs set on the two base lines, and by setting cuttings or rooted vines close to the copper ringlets on the wire line, perfectly straight and even rows can be had in every direction.

Too much stress cannot be laid on this work. Remember that the vineyard is to last for a lifetime or more, and that any careless work will ever be an eyesore and a drawback. Unsightly vineyards, carelessly staked out, are never worth as much as those carefully planted, where every row is straight, and where plowing, cultivating and other farming and vineyard work can be performed without meeting any obstacles in the way of crooked rows, or of vines standing out of line. Only too frequently vineyard rows are plowed out, and the cuttings are "slapped" in any way in order to get the work quickly done. In after years, when the proprietor's taste and experience has improved, he finds that his reputation as a careless or ignorant grower cannot be changed; for the vineyard is there to last, and to tell the tale of early ignorance or neglect.



1-a, b, c, d.—Vineyard Tools used in the Currant Vineyards of Zante.

Relative Value of Cuttings and Rooted Vines.—Cuttings and rooted vines have their advocates, but the majority of vineyardists are now in favor of planting rooted vines, and I would myself choose the latter every time. As, however, rooted vines and cuttings are both likely to be used as long as vines are planted, a few words in regard to their respective merits may be of general interest. In planting cuttings, we are never sure that they will all grow. Cuttings if cared for generally do well, but sometimes, even with good care, they fail, and the loss and annoyance is then always great, and even in very careful planting seldom over ninety per cent live, while often twenty-five per cent die. The reason is often careless planting, when the season is favorable, but in unfavorable seasons the failure must be attributed to other causes. Those cuttings which grow, generally grow well and often make as good vines as those raised from previously rooted ones.

The replanting of the cuttings that failed to live is both expensive and troublesome. Every vineyardist knows how difficult it is to succeed in making cuttings, or even vines, grow on places in the vineyard where other ones have failed to grow before. Some attribute this difficulty to some poison in the soil, but I believe the cause will be found in the greater difficulty to attend to a few young vines in among the older ones. The older vines will naturally use up the moisture in the soil, and the cuttings, with their young and tender roots, will have but little chance in the general struggle for life. But even if we suppose that the replanted vines will do equally well, it will be found that the replanting of the cuttings is actually more expensive than the first planting. The reason why this is so lies in the greater work in getting the soil in first-class condition after the first planting failed. In the first planting, the soil has been put in order with the help of horses and plows, while, when we replant, the very spots where the vines are to be located cannot be reached by other means than by a pick or shovel, as, no matter how well the old vineyard is plowed, there will always be a hard spot around every vine, or around the place where the vine should be, and where it failed to grow. If only a few cuttings have taken root, it is better to plow up the whole vineyard and reset, and in so doing endeavor to do better work. I know of vineyards where the owners have not succeeded in replanting during ten years, every year spending money and labor with little success. There will always be a few cuttings that fail to live.

The causes of the uncertainty of cuttings are our inability to foresee the outcome of the season's climatic conditions. More or less rain has a direct influence on our success. Thus in very rainy seasons the cuttings should be small or rather short, so as to be as much as possible in the upper, dryer and warmer soil. In dry seasons, again, the cuttings should be long, so as to be in the moist ground, but as we can never foresee what the season will be, we had better have a recourse to rooted vines, which, if in good condition, will be comparatively independent of weather and wind.

The Making of Cuttings.—The making of cuttings is not a difficult process, but nevertheless it should be carefully done in order to insure final success. After the vines have been trimmed and the trimmings have been placed in small piles along the rows of the vineyard, the cuttings should be made as quickly as possible on the spot, the laborers moving from pile to pile as they finish up. The shears should be sharp and kept sharp, both to insure good cuttings and to hasten the work. A poor shear is worse than a poor farmhand, and it pays to keep the best kind of every tool that is used in vineyard work. The size of the cutting must be decided upon according to the conditions of the soil. If the land is very wet and is likely to remain so, an eight-inch, or even a six-inch, cutting, will do, and will grow better than a long one. Long cuttings will reach down into the wet soil and decay at the lower end before they take root. In dry and warm soils the cuttings may be from twelve to eighteen inches long, or even longer if it is desirable to bend them in a circular way in the holes in which they are to be planted, or if the soil is very warm and dry, when it is of importance that the cutting should reach the deeper moisture. A twelve or fourteen inch cutting is probably an average size cutting, and one that will answer most conditions, in case they are not previously known.

A nurseryman, or any one who can give his cuttings as much attention as they require, can use even the very tips of the vines and make them grow. But for general planting, especially direct in the field, seldom more than one or two cuttings can be made from a branch. The cutting should be cut immediately below an eye or joint. Such cuttings grow better, are easier to plant and are less apt to dry out. The more eyes a cutting contains the better is the cutting, as the roots mostly form at the joints. Many make the cuttings with a heel of old wood, but I do not believe such cuttings are in any way preferable to those made of only one season's wood. The old wood does not grow any better than young wood, generally not so well, and, besides, such cuttings with heels are more difficult to plant and handle. When the cuttings are made, they should at first be placed in small piles, with the top ends all the same way, and as soon as possible afterwards tied up in bundles, with at least two strings to every bundle. For tying, any string will do, but split basket-willow twigs are probably the strongest and least apt to root. Still any stout twine will answer the purpose. From one hundred to two hundred cuttings may conveniently be put in each bundle, according to the size of the cuttings.

The Care of Cuttings.—After the cuttings are made and bundled, they should be labeled with wooden labels and immediately taken to some place where they can be heeled in. The lead-pencil is the best for writing the names. The best place in which to heel in the cuttings is on the north side of some large building, under an open shed or under some large trees. In fact, any place which is partially shaded and cool will do. If the bundles are to be used soon or shipped, they might be placed on the wet ground, and only covered with sacks or with straw, but, if they are to remain any longer time, they must be placed in the ground and carefully covered. A trench should be dug half the depth of the cutting, but slightly wider. The bundles are placed in the trench upright, and after the trench is full the soil from the new trench, parallel with the first one, is thrown on and around the bundles so as to keep them moist. It is best not to keep the cuttings too moist, and on no account should they be wet, as they will then begin to root rapidly, and when they are again removed these roots will break or dry up to the great injury of the cutting. If unavoidably the planting is delayed longer than expected, the bundles of cuttings may be taken out and placed in dry air for a day or for a few hours, and then replaced in the soil. This may be done several times without any injury accruing to the cuttings, the only effect of the drying being to retard their rooting and sprouting, but it should of course not be done after they have once begun to callus or root. To place cuttings in water for any length of time is nearly always injurious, and especially so if the water is bad or contains manure. Manure water always kills cuttings readily. If the cuttings have sprouted, or begun to make roots, or form callus, a careful vineyardist will take his bundles to the field submerged in a barrel or bucket of water, or at least wrapped in wet sacks or blankets. If again the cuttings are dry and a fresh cut does not show a flow of sap, they may be freshened by soaking in fresh water over night. Even very poor and dry cuttings are easily revived this way, but a continuous immersion for several days will injure the cuttings and cause them to rot. It is also of importance that the water should be clear and cold, or at least not warm. Instead of immersing the cuttings in water, they may be set down in cool and moist soil for three or four days before being planted. The soaking in water is the simplest, quickest and most effective for slightly dried cuttings.

Planting Cuttings.—Planting cuttings in the vineyard can be done in several different ways. They may be planted with a spade, with a flat planting bar, or with the "sheep's-foot." Each one of these tools will answer the purpose if properly used, but their selection must depend upon the quality of the soil, and upon the nature of the land generally. In all planting of cuttings, the following points must be observed as of importance in insuring success. The cuttings must be set in moist and cool soil. The lower end of the cuttings must lodge in solid ground, and there must be no air space at the bottom. Only one eye should be left above the surface of the soil. The soil must be tamped well around the cutting from the bottom to the top. All inferior cuttings should be thrown away, and every cutting should be examined before it is planted.

For a description of the tools used in planting, I beg to refer to the end of this chapter. I will now further consider the above points. Many failures are made by not planting in moist soil. If irrigation is needed, irrigate before planting, then plow and harrow, and then plant. When moist cuttings are planted in dry and warm soil, the latter will extract all the moisture from the cuttings, and the latter will fail to grow. I have seen parties first plow deep furrows through the vineyard, so as to air and dry the ground before planting the cuttings. This is not necessary and even harmful. Moist and warm ground is essential to the starting and growth of cuttings. The lower end of the cutting should be lodged in solid ground, or the cutting will fail to grow. This point is of the utmost importance, and should be carefully observed. If, when the cutting is pushed down in the soil, a small air chamber form at the lower end, the butt end of the cutting will mold, and the latter will be poisoned and die. Nine-tenths of all the failures in planting are caused by neglect in this respect. Care is especially needed when the sheep's-foot is used. Only one eye should be left above ground, which is enough for all purposes. Any more eyes will exhaust the cutting before it is rooted, and the additional length of the cutting will expose it to the danger of being broken or otherwise injured. The soil must be tamped hard all along the cutting so as to cause the latter to attract the necessary moisture. Loosely set cuttings very often fail, especially in dry seasons. All inferior cuttings, especially those frosted or otherwise injured, should be thrown out before being brought to the field. A cutting costs so little that it pays to use only the strongest and best, when a much better stand will be the result. Frosted cuttings can be detected by their darker color. Fresh and healthy cuttings should have a green and fresh cambium or inner bark, and a fresh cut should show fresh sap oozing out.

When the sheep's-foot is used in planting, the butt end of the cutting is inserted in the forked end of this tool, and this explains why it is necessary to have as little wood as possible below the last eye of the cutting. By pushing the sheep's-foot down in the soil, the cutting is pushed simultaneously down to the proper length; a twist is then given the sheep's-foot so as to get it loose from the cutting, and the former is then pulled up. It may in some instances be necessary to push down the cutting with the left hand, while the sheep's-foot is being pulled back, as care must be taken that in pulling back the sheep's-foot the cutting is not lifted. Even the smallest lift will cause the lower end of the cutting to hang in an air chamber, and this will, as I have stated, cause the cutting to mold and die. When planted, a few sharp taps with the foot will sufficiently fix the cutting. When the flat bar is used, a hole is first made by the bar, the cutting is then inserted, and the hole filled up by again inserting the bar near the cutting, and by pressing it forward towards the latter. Neither of these tools can be used in dry or stony soils, but in moist and loamy soil, which has been previously well prepared, they are most excellent, as doing the work both quickly and well. The sheep's-foot is unexcelled for speed in loose soil, while the flat bar is of advantage where the soil is a little harder. The flat spade is used when rocky and stony or even gravelly soil interferes with the using of the former tools. Every farmer will know how to use the spade, and no further explanation is required here.

Some plant the cuttings slantingly in the soil, in order to bring them as near the surface as possible. This is well enough and proper in very wet soils, where the lower strata are too cool, but in this warm country the perpendicular planting is easier and better. By twisting and bending the cutting in the dug hole a longer cutting can be used, but I have seldom found any advantage of very long cuttings, and few soils are suited to raisin grapes when such methods are needed to produce strong and rapidly growing vines.

Care of Young Cuttings.—In places where irrigation is needed and used, many irrigate the cuttings immediately after they are planted, so as to settle the soil. This, however, is only needed where the ground is very dry or very sandy. It is much the better way to irrigate before planting and to plant on the loose soil after it has been replowed and properly prepared. Such soil keeps the moisture for a long time, and even in dry climates will require no irrigation for months after the planting. The principal care, after the cuttings have been planted, but before they are fairly started, is to keep the ground loose and to prevent it from baking on the surface. The best way to accomplish this is to run a revolving randel harrow over the land regardless of the cuttings. This kind of harrow consists of a row of vertical, slightly concave steel discs, which revolve when the harrow is pulled over the land. No regard need be paid to the rows of cuttings, provided they do not stand too high above the surface, or have begun to swell. Not one cutting in a hundred is injured, and those that are cut off are sure to sprout from below. After every shower of rain, the land should be harrowed or pulverized in this way. If the soil is baked and hard around the cuttings, the latter will be slow to start, but a loosening of the soil will have the desired effect almost immediately. The amount of irrigation needed for young plantations can only be decided upon on the ground. The cuttings should be kept growing, and young leaves should always be seen at the tips of the branches. Long before these young leaves cease growing, a copious supply of water should be added to keep the soil from becoming too dry.

Transporting Cuttings to Distant Parts.—When cuttings are to be shipped any distance, they must be packed. The simplest method of packing for short distances is to fill the bottom of a sack with wet straw, and then slip the bundle of cuttings down in the sack, and a single string will then suffice to secure the sack to the bundle. Packed this way, cuttings can stand a voyage of a week or more if the weather is not too hot. If a longer voyage, of say several weeks' duration, is necessary, the cuttings should be packed in dry-goods boxes, and, if the time of transit is not too long, no other packing is needed. If, however, a very long transit is in view, more precautions for the safe arrival of the cuttings are required. After the bundles have been pressed down in the box, moist and fresh moss is packed tightly down all along the sides of the box. Such packing will keep the cuttings fresh for over a month. For a longer time, coarse, pulverized charcoal filled in between the cuttings is a splendid packing. The charcoal must be dry, the moisture in the cuttings being enough to keep them alive for several months. Packed first in tin boxes surrounded by charcoal, and then the boxes soldered tightly, so as to allow no air to enter, is the safest method for transporting cuttings long distances. If there is a possibility to repack at certain stations on the road, wooden boxes may be used instead of tin. The waxing of the ends of the cuttings will help to keep them moist. All lumber boxes should be lined with waxed paper, and all cracks carefully nailed up, as by the drying of the boards the contents are very liable to run out. Large and heavy boxes should be surrounded by iron bands.

Rooting Cuttings.—There are two ways of planting cuttings in the nursery in order to have them rooted for next season's planting. One way is to plant in nursery rows four feet apart; the other is to set in beds. For such nursery, a plat of land with rich soil and with good water facilities should be selected. Water should never fail in the nursery, as cuttings always require more water than old plants set farther apart. The rows should be staked out four feet from each other. Six or eight inch cuttings should be used, according to the depth to moisture; the more moisture, the shorter need be the cuttings. With a big, flat hoe the soil along the line of the row is thrown up on one side, the cuttings are set down upright close to the perpendicular side, and the soil is again raked back with the same kind of hoe, and then tamped hard around the cuttings. The latter need not be over two or three inches apart, and from forty to fifty thousand may be set on one acre of ground. In no instance should the cutting be left more than one or two inches above the surface of the ground. The best instrument or tool for opening the soil and for covering the cuttings is the large flat-faced Italian hoe, used by Italian workmen both in Europe and in this country.

If the bed system is adopted, much smaller cuttings may be used, although it is not necessary to have them smaller than six inches. The beds may be two feet wide and four feet apart, in this respect resembling nursery rows, and treated just as such. The cuttings are set in the beds two or three inches apart each way. We must remember that such cuttings require much more water than cuttings planted in four-foot rows, as the quantity soon exhausts the moisture in the soil. The beds may also be square, each one surrounded by a little bank or levee of soil in order to hold the water. In these beds, which should be slightly below the general surface of the ground, the cuttings are set very close,—two or three inches apart,—until the whole bed is filled up. These beds are never cultivated in any other way than by pulling the weeds out by hand. They must be frequently irrigated by flooding, except when the soil is immensely wet or moist.

Vines may also be propagated from a single eye, or from cuttings containing a single eye. Such cuttings may be set perpendicularly in beds or in rows, or they may be placed horizontally in boxes with pure sand, and entirely covered over. The single eyes soon sprout and make nice little plants, with a well-developed system of roots.

All these cuttings planted in beds, if properly watered during the summer, will make excellent vines to be set in vineyard form next season. Being set so close, they require much moisture and irrigation, the many new roots soon exhausting the moisture in the soil. It is better, however, to have the cuttings set as closely as possible, so as not to get too strong vines. An overgrown vine is more expensive to plant and more difficult to handle than one of medium growth. Besides, the latter has a greater number of fibrous roots, which, if in good condition, will give a quick start and rapid growth to the new vine.

Care of Rooted Vines.—The same precautions are to be observed with rooted vines as with cuttings, only more care is required to shield the roots from the sun and wind. Wet blankets or sacks should always be used when the roots are taken to the field, and, if the vines show the least sign of being dry, they should be soaked for several hours in pure water, and in this respect treated just like cuttings.

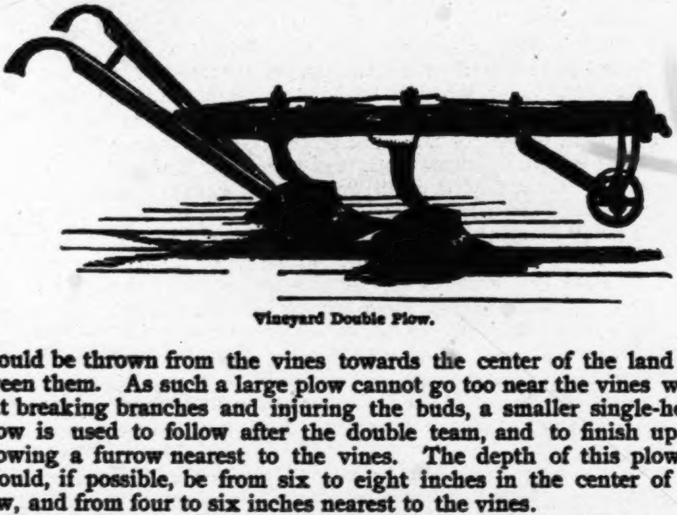
Planting Rooted Vines.—Planting rooted vines is not attended with many difficulties. The most important points to observe are these. The vines must be freshly dug. If not, or if the least dry, soak in water over night. Cut away all dead or dry rootlets. Prune the top of the vine down to two or three buds, and leave only one spur. Have the vines covered while carried out in the field, and plant only in moist ground. The young and tender roots are easily dried if set in warm and dry soil, and they will afterwards decay and injure the vine. A carefully planted vineyard, where rooted vines alone have been used, and where every precaution has been taken to insure success, should have about ninety-seven per cent of the vines growing. To make every one grow would only be possible in a very small plantation. In the large raisin centers, all this planting may be contracted for. The cost of planting cuttings is generally calculated at one-half cent per cutting, and for rooted vines at one cent per vine. Frequently parties contract to supply cuttings and to plant the land for from eighteen to twenty dollars per acre or less. It is generally better to pay the higher price and get the work done properly.

Proper Time for Planting.—The time for planting cuttings depends greatly upon the season, the quality of the soil and the moisture. In wet seasons the dry land should be planted first, and cuttings might be started there as soon as the first frost allows us to make them with advantage. The moister the soil the later should the planting be begun, and on the contrary the drier the soil and the warmer, the sooner should the cuttings as well as the rooted vines be planted in the fall. December and January are the best months to plant, although with care cuttings as well as rooted vines may be set as late as in April or even in May. As a rule, early planting is better, as it gives the cuttings chance to root well before the hot weather causes the shoots to start. In very rainy seasons, or in wet places, cuttings should be planted later than rooted vines. Moisture in undue degree will cause cuttings to rot, while its influence on the roots of the vines is not as great. Rooted vines stand both moisture and drought better than cuttings do. On sandy, dry soil and in dry seasons I would wish my cuttings planted as early in December as possible; while, on wet places, I would delay planting until after the frost is over in February. The same rule applies to rooted vines, but we must remember that roots begin to send out rootlets almost as soon as they are dug, and that early planting will preserve these for the early use of the vine, while, in late planting, almost every one of these new roots will be destroyed in planting and must be produced over again. We might also say that both cuttings and rooted vines should be set as soon as the soil is in proper condition in the fall. Do not wait for anything after the soil is dry enough to permit planting. Early planted vines will have a good start.

Cost of Cuttings and Rooted Vines.—The price of Muscat or raisin-grape cuttings generally varies from two dollars and fifty cents to five dollars per thousand, and have been sold as low as one dollar per thousand cuttings. Rooted vines again vary from ten to twenty dollars per thousand, according to the demand and supply. The cost of planting is, of course, different in different localities. In Fresno the ruling prices for vineyard planting with cuttings is one-half cent per cutting. The men board and lodge themselves for this sum. For rooted vines the price is from sixty cents to one dollar per hundred vines. The ground must be in a perfect condition, but the success of the work is never guaranteed, as so much depends upon after treatment. While the actual cost of planting the grapes is insignificant, it will be found that the many different expenses of a large vineyard of say 160 acres will be quite considerable, and few of our larger raisin vineyards in irrigated districts have cost less than fifty dollars per acre during the first year. This includes labor, buildings, tools, etc., but not the first cost of land. With experience and constant supervision, this cost may be reduced somewhat, and under very favorable circumstances from twenty to forty dollars even per acre may cover the cost of planting and maintenance during the first season. But estimates in this direction are not reliable, as one man will spend twice as much as another under similar circumstances.

PLOWING AND CULTIVATION.

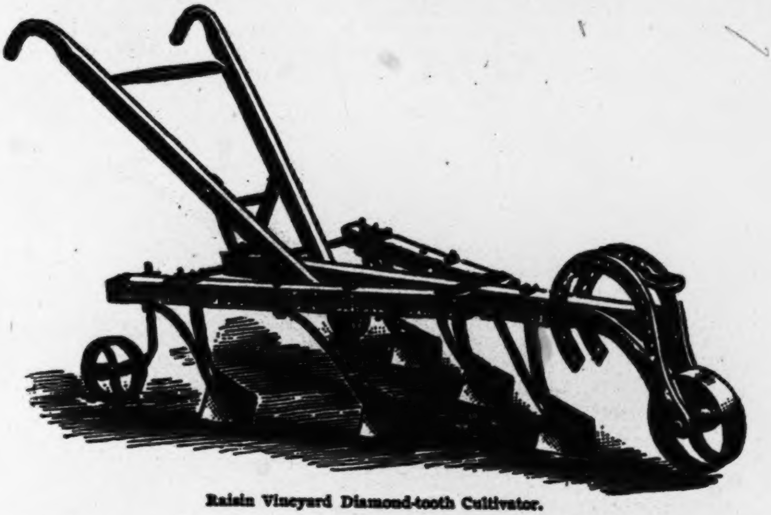
Winter Plowing.—The plowing and cultivation of a vineyard comprise different operations, both in the spring, winter and summer. Winter plowing should begin as soon as the vines are pruned, and should be finished before the buds begin to swell in the spring. The plowing should begin with a large plow and two horses, and the soil should be thrown from the vines towards the center of the land between them. As such a large plow cannot go too near the vines without breaking branches and injuring the buds, a smaller single-horse plow is used to follow after the double team, and to finish up by plowing a furrow nearest to the vines. The depth of this plowing should, if possible, be from six to eight inches in the center of the row, and from four to six inches nearest to the vines.



Vineyard Double Plow.

Plowing Devices.—To enable the single plow to run as closely to the vines as possible without injury to the vines, several devices are used. The block device consists of inserting a block of wood two inches wide between the center of the clevis and the plow-beam. This throws the singletree out to one side and enables the horse to walk at a distance from the vine, while the plow follows as close to the latter as possible. In combination with this block, the singletrees should be so constructed as not to catch the branches of the vines. This is best accomplished by attaching to the outside end of the singletree a flat, doubled leather strap, to which is fixed a common, large snap, in which latter the traces of the harness are fixed. Such a singletree will glide by the branches without giving them a chance to catch anywhere. Similar singletrees, or even doubletrees, should be used wherever vineyard work is to be done, and they have the double advantage of being cheap, practical and easily made by any farmhand handy with tools.

Cultivation.—The cultivation should always follow the plowing immediately, so as to prevent the soil from baking, and so as to tear up the roots of the weeds which have been partially dislodged. The first cultivation, which should always be in the same direction as the plowing, should be followed by cross-cultivation. The latter brings the soil back towards the vines, filling up the hollow formed by the throwing of the soil from the vines.



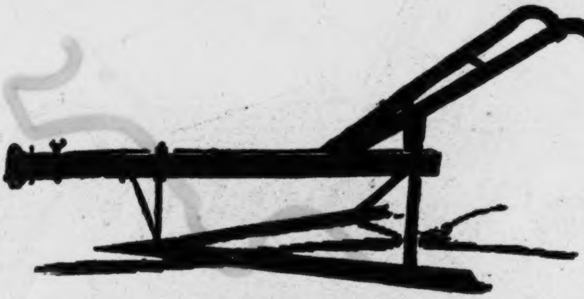
Raisin Vineyard Diamond-tooth Cultivator.

Back-furrowing.—Later on, when the weeds have to some extent decayed, a double-shovel plow is by some growers used for turning a part of the soil back towards the vines. One round of this plow on each side of the vines is all that is required, as the repeated cultivation that should be carried on in a vineyard will generally suffice to bring the balance of the soil back from the center of the land towards the vines.

Cross-plowing.—Cross-plowing is not absolutely needed, and in many places not even possible, as where the vines are planted closer one way than the other. But wherever plowing can be done both ways, the land will be benefited by being plowed one way one year and the other way the next year, so that in course of time all the soil will be regularly broken up. When there is plenty of time and enough labor, cross-plowing the same season will greatly benefit the vines.

Weed-cutters.—These are used to great advantage after the first plowing, and any cultivator may be rigged with one of them, or they may be made as separate tools. The cutter-bar is simply a flat bar, which is bent in the shape of a very wide U, and is fastened to the beams of the cultivator just behind the last shovels or blades. The horizontal part of this cutter-knife should be on the same level as the center of the cultivator blades, and stand as horizontal as possible, in order to be subjected to the least amount of friction. The effect of such cultivator cutters are that no growing weeds are left behind wherever they pass.

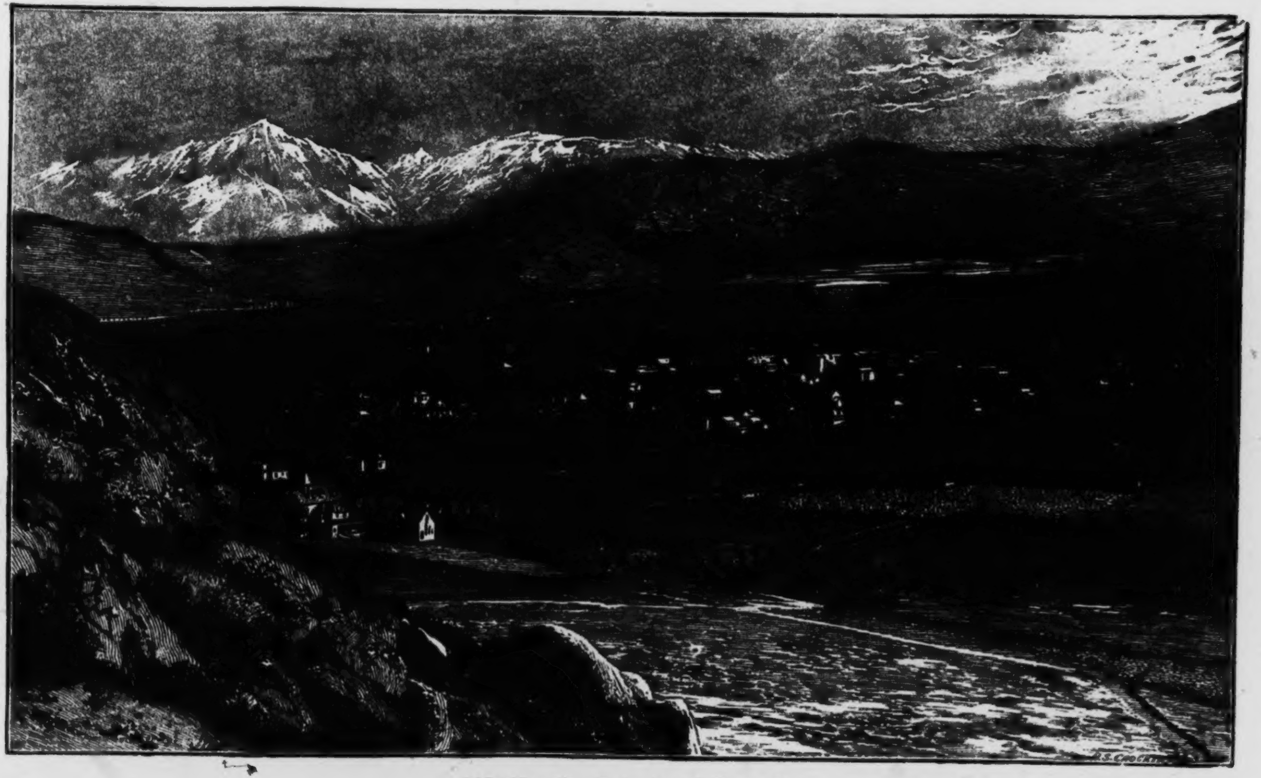
Cutter-sled.—I have used with great advantage a combination of this cutter-knife and a sled, upon which the driver could stand and ride, and its use saved time, besides doing the required work well. Such a cutter-sled is, however, only useful in already well plowed and cultivated soil, and for summer work it is just the thing and can then not be surpassed by any other weed-cutting tool which I have ever seen used.



Raisin Vineyard Weed-cutter.

Various other tools are used, and different ones at that in each separate district. Each grower has his particular way to cultivate and plow, and not two vineyardists do the work alike. Each one has his favorite tools and instruments, which he often changes from year to year or replaces by new inventions of local mechanics or inventors. A description of these tools and the various methods of plowing, cultivating and bringing the land in proper condition would make a book of itself and would be merely a history of each individual vineyard in the land. An enumeration of them will be found later on.

The cultivation of the vineyard should be continued as long as it can be done without causing injury to the new growth of the vines. The exact number of times the vines should be cultivated is impossible to decide upon beforehand, as almost every vineyard requires a different method of working. It is safe to say that during the summer no weeds should be allowed to grow in the vineyard, and, as long as any of them are left, the soil should, if possible, be cultivated. Every weed acts like a chimney for the moisture in the soil, which it



Riverside: City, Orchards and Vineyards.

sucks out to the detriment of the vine, while weeds which grow in among the branches of the vines will also seriously interfere with the picking of the grapes.

Hoeing.—Only little manual cultivation is needed. In the spring, after the first plowing and before the buds have started or have grown long enough to interfere with the work, the vines should be hoed. The object of hoeing is to loosen the soil nearest the vines, and to destroy all the weeds which cannot be turned under by the plow, and especially those which grow close to the vines. The best tool for this purpose is the common, heavy hoe with a long handle. A very useful hoe can be made of old shovels which are so worn and broken that they cannot be longer used for digging. The blade of the shovel is fixed to a new handle at a right angle, similar to a hoe handle, while the blade itself is left as it is. Such hoes are very useful in cutting heavy weeds, and work with great facility. Forked hoes are used by many vineyardmen, especially for stirring the hardened crust around the vine, but I believe the common, heavy hoe a more useful instrument, and if used in time will make the forked hoe unnecessary.

Time for Cultivation.—Too early plowing or cultivation before the weeds have started is not always desirable, as it prevents the weeds from growing. Such weeds, if turned under, will yearly enrich the land, and in course of time form a heavy and humus-rich top soil, which will serve to keep the moisture in the soil below. I therefore advocate plowing as late as possible. The exact time must be decided for every particular season and for every separate locality, and no general rule can be given. Wet lands should be plowed earlier than dry lands; it is the latter which especially require the green weeds to be turned under, and which will be the most benefited by the accumulation of humus. Our vineyardists disregard this fact too much, and are generally too apt to plow their dryest lands first.

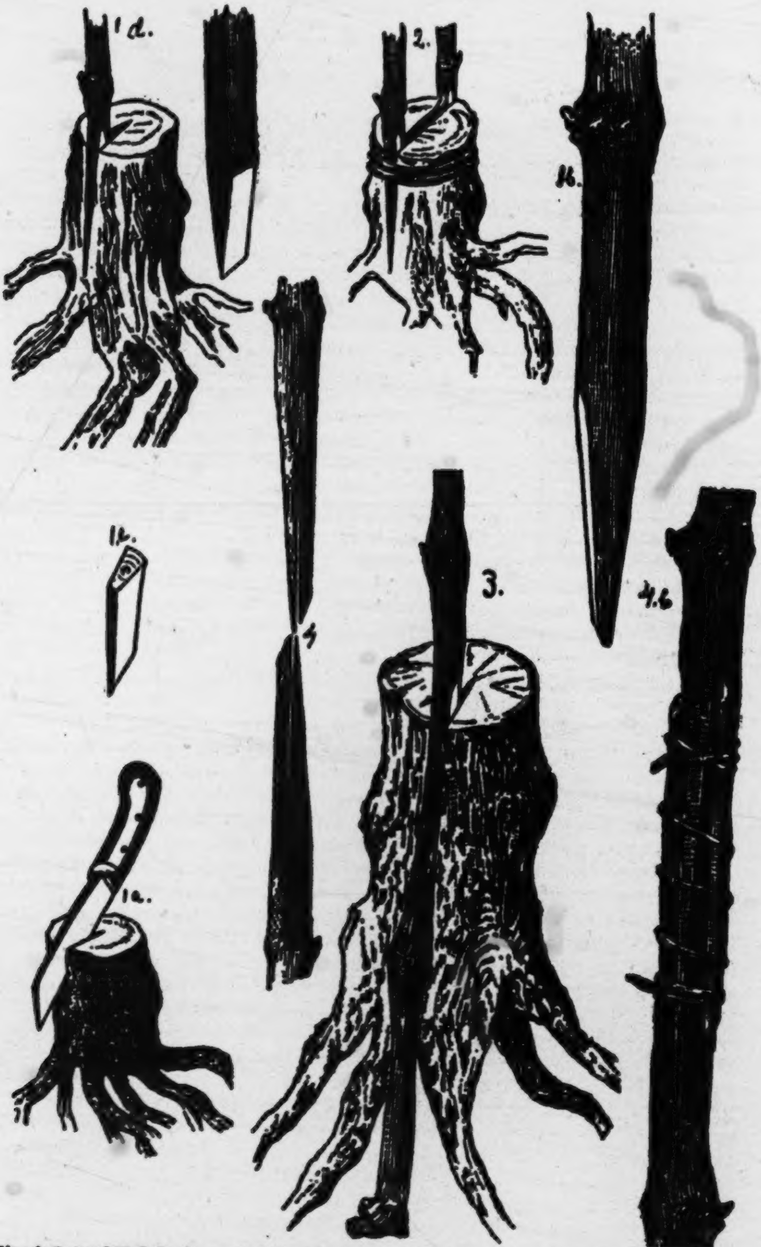
GRAFTING THE MUSCAT ON OTHER STOCKS.

Time for Grafting Raisin-vines.—The best time for grafting grapevines, as well as for grafting anything else, is when the stock on which we graft has its sap in circulation, and when the scions or cuttings which we are to insert in the stock are yet dormant. This time occurs from the middle of January, when the sap first rises in the old vine, and continues to March or even April, February and March being generally the months best suited to the work. Grafting may also be done in the fall of the year after the grape crop has been gathered, while some growers have best succeeded still earlier, and advocate the month of August as being the most favorable time for this process. The sap at that time ceases flowing, and there is no danger of its being clogged. Grapevines can be grafted at almost any time of the year at which the weather is not too warm, as this will cause the cuttings to bud out before they have joined the stock. If grafting on resistant stocks is desired, the stocks, if small, must first be dug, and the grafting can then be performed in the workshop any time between December and March, the early winter months being preferable.

Points to be Observed in Grafting.—The main object in grafting is to properly join the scions and the stock. The point of junction should be the cambium layer, or what is commonly called the inner bark. If a cutting of a vine is cut off smoothly and placed in the ground, the callus soon begins to form at the lower end. This callus, which is seen to exude from the green layer between the hard wood and the bark, is fed by the sap in the cutting descending through the cambium layer and forming new cells at its free end. If this callus joins a similar callus of the cambium or green layer of the stock, the two calluses unite and form together a new vine, in which the top consists of the new scion and the root of the old vine. The junction of the two is the place where the cambium surface of the scion met the cambium of the stock. In the scions, the cambium lies very close to the exterior layer of the cutting, the bark here being very thin, while in the old stock the cambium is situated many times deeper in, the outer layer or the bark being very thick. It is not necessary that the cambium layers of the two should meet or join all along the cut surface, and a few points of contact and junction is sufficient, although it is better to have as large a junction surface as possible If the two cambium layers do not meet, the scion will not grow, or, as it is called, take. The scions must be dormant when being grafted, and, if their buds have begun to swell, they will probably not take, or at least success is less certain. In order to keep them dormant they should be cut early in winter, and then be buried in cool and only slightly moist earth, either in a cellar or on the north side of a house, where the sun and heat will not strike them and cause them to start their buds. If the callus should form, or even root, the callus and roots may be cut away without great injury to the cuttings. If the cuttings are dry, they should be soaked for a few hours in tepid water, and afterwards buried in moist sand. This treatment is often useful for imported cuttings which have been injured in transit. They often recover vigor wonderfully fast, and should never be given up for lost as long as there is any green-colored cambium left, in which the sap may again be brought into circulation.

Various Methods of Grafting.—The general way to graft is to graft on old stocks. Vines of one variety are thus changed into the variety we wish to grow, and from which the scions are taken. The first step is to dig away the soil from the vines down to the first roots, which should be done by a separate gang of men. Next the stocks are sawed off horizontally at the first roots, or say from four to six inches below the surface of the soil. This should also be done by separate hands so as to insure rapidity and skill in the work. Some grafters saw off the stocks somewhat slanting, so as to cause them to shed the sap which always exudes from the stump. Next in order comes the splitting of the wood of the stock and the insertion of the grafts. This requires care and skill, and should not be done by careless hands.

The splitting of the stock is done in several different ways, and to accomplish it we can either use a knife and a wooden mallet or a handsaw. If the former is used, the knife must be sharp and thick, so as to stand the blows of the mallet. Some growers even use a sharp



Simple Lateral Cleft Graft. *1a.* Splitting the Trunk. *1b.* The Scion. *1c.* The Beveled End of the Latter. *1d.* Scion and Stock Joined.
2. Simple Transversal Cleft Graft with Two Scions. 3. Cleft Grafting with a Cutting Graft. Champin Graft, or Graft on a Rooted Vine. *4a.* Graft and Stock Before being Joined. *4b.* The Same After being Joined. All after Aimé Champin's "Vine Grafting."

chisel. If a saw is the tool used,—and I prefer it every time,—the edges of the old wood should afterwards be pared off smoothly with a sharp knife, so as to leave no rough marks of the teeth of the saw. The stock is split straight across, as in the cleft graft, and one scion is then inserted at each end of the cleft on opposite sides of the stock; or the stock is split on one side only, care being taken that the cleft does not extend across the stump, and in this cleft a scion is carefully fitted as before; or a wedge-shaped piece may be sawed out or cut out of the stock, and of the size that can be fitted by a scion. It makes but little difference what method is used, as with ordinary care and skill the scions will take quite readily. Even if they should entirely fail, the same stocks may be grafted over next fall or next year, as they keep their vitality almost unimpaired for years after they are cut. It is only necessary to saw them off until fresh wood is reached.

The next work is to insert the scions. They should never be longer than sufficient to have one eye above the surface of the soil, two or three eyes to the scion being generally enough. The cuttings are first cut in sufficient lengths in the field, or on the spot, and there pared to fit the cleft in the stock. If prepared in the house, they are apt to dry out and become ruined. By keeping them in water they may be kept fresh, but this greatly injures their quality. The best way is to bring the cuttings out to the vineyard wrapped up in wet sacks, and to cut and pare them on the spot where they are to be grafted. With a sharp knife the two opposite sides of the scions are pared off tapering, but not necessarily to a fine point. The scion is then fitted in the cleft, a small wooden wedge being useful for holding the latter open while the scion is fitted. If the stock closes tightly upon the graft, no tying is required, but, if the grip of the stock is not sufficient, tying is needed. Cotton cloth, manilla rope or anything that will hold the two together will answer the purpose. The stocks and scions will both dry slightly, and the tying should therefore be secure and tight.

A piece of bark of the vine is next placed over the cleft, so as to prevent any soil from falling in the cleft, and very careful grafters use a paste made of a mixture of two parts of adobe or clay and one part of cowdung, for covering both the cleft and the sides of the grafts outside of the tying. A stout stake is driven in the ground close to the graft, and the two tied together in order that the graft may not give or be disturbed in the least. The hole is next filled with soil, which should be packed tightly and heaped above the scion, thus forming a small mound above the ground all around the graft. The soil should not be disturbed until the new shoots are well above the ground and have begun to harden their wood, at which time the security of the graft is fully assured. One or more of the grafts may be left growing for the first year, and later on all except one graft are cut off so as to give the vine only one trunk.

In grafting on resistant stocks, the latter generally being smaller then old stocks, a different graft may be used, such as the whip graft. This graft should be above or at least near the top of the ground in order to prevent the scion from taking root, the latter's roots not being resistant to the phylloxera. Such grafts should be carefully covered with the clay mixture, and soil should be heaped up over their tops. To prevent the scions from drying out, their tops may also be covered with grafting wax.

Stocks and Their Influence.—The old stock has a decided influence on the scion and the new vine. Which stock is the best on which to graft the Muscat has not yet been determined, but we may presume that any strong and healthy growing variety will answer our purpose. During the first year, and also during the second year, in many instances the new vine assumes a character half way between that of an old-stock variety and that of the variety of the scions. Thus I have seen Muscats grafted on Sultanas and Zinfandels which were almost identical with these varieties. If I had not positively known that they were the tops produced from Muscat scions, I would never have believed them to be anything else than suckers from the old stocks. The leaves, berries and branches of these Muscats were the first year exactly like Sultanas. The berries of those grafted on black grapes were, however, in this instance, not black but white, but I have heard of other instances in which they were partially colored. Some vines, again, showed characteristics of both varieties, the leaves generally being similar to the old stock, while the grapes showed the characteristics of the Muscats. This bastardity, however, wears off in a year or two, and finally the vine assumes the full characteristics of the scion variety. When this takes place it is evident that the sap of the scion or the top of the vine has either changed the root, or through its quantity overpowered the effects of the root-sap.

Muscats grafted on Malagas, Feher Szagos, Sultanas and Zinfandels all do well in time, and in many instances bear even better than Muscats on their own roots. Our experience in grafting the Muscat is, however, limited, and we do not know with any certainty which roots are the most favorable or the most unfavorable on which to graft the Muscat grape. I have seen grafted Muscats on wine stocks which did not do well as regards bearing, while the growth of the vines was rather vigorous. These varieties mentioned above are, however, suitable stocks for Muscat grafts. I learn from Mr. R. C. Kells of Yuba City that the late Dr. S. R. Chandler of the same locality cleared the third year seventy-five dollars per acre from Muscats grafted on Mission vines. This must be considered as very successful, especially as I have heard of other instances where similar grafts did not bear sufficiently the third year to pay for the labor of caring for the vineyard work that year.

VARIOUS SUMMER WORK.

Sulphuring.—Sulphuring the vines is now considered a most necessary operation, and without doing it well and in time no good crops can be relied upon. It is true that good crops of grapes are sometimes had without sulphuring, but this is only due to chance; the absence of mildew, and immunity from disease of unsulphured vines are rare, even in otherwise most perfectly kept vineyards.

The sulphuring consists in thoroughly dusting the growing vines, leaves, branches, flower buds and berries with powdered sulphur.

The first sulphuring must be done when the grapevines leaf out in the spring, and, when the young shoots are about six inches long, it is about time to commence. Many growers sulphur only once, some go over their vines two times, but our most successful growers,—those who get the best and largest fruit crop of grapes and bunches,—sulphur in unfavorable seasons three or four times. The second sulphuring is done just before the blossoms open, and may even, provided the weather remains cool and windy, be done in the open blossoms with great benefit to the setting berries. Miss M. F. Austin of Fresno was the first to successfully sulphur in the open blossom, the result being very large crops. But not all have been as successful as she, and one of our most experienced vineyardists and raisin-growers, T. C. White, prefers to sulphur just before the blossom opens, as, in case of very warm weather when the sulphur is thrown on the blossom, the latter is apt to blast. We are therefore on the safe side if we sulphur just before the buds have opened, and after the grapes have set. But on cold, windy days when one of the cold electric northwest winds are sweeping down the valleys,sulphuring must be done whether the blossom is open or not, as it is just at this time the sulphur is required the most, in order to counteract the formation of the first stage of the powdery mildew. The vapor of the sulphur destroys the germs of the mildew, and thus prevents the latter from causing the grapes to fall off. After the grapes have fully set, no further sulphuring is required except in the case of heavy rains or in continued cloudy weather, when there is always danger that the mildew will reappear. If heavy rains should occur during the summer, a renewed sulphuring is always necessary or at least advisable, but in ordinary seasons no sulphuring is needed after the berries have set well, as the germs of the mildew are then sufficiently injured to not develop later in the season.

Sufficient sulphuring is always noticeable in the vineyard by its smell, and, when this smell is strong and pronounced, no further sulphuring is required. The sulphur is applied to the vines either by the "dredger" (or dust-can) or by a pair of sulphur bellows. The dredger is used when the vines are small, while the bellows are necessary to spread the sulphur evenly when the vines have reached a certain size. Many growers use, during the first sulphuring, small burlap bags filled with sulphur. The meshes of the burlaps are large enough to allow the sulphur to go through. The sulphur should be finely pulverized to be effective, and the sublimated French sulphur is by many considered the best. The cost of sulphuring varies according to the size of the vines, but is generally about three dollars per acre. Young vines under three years of age require little sulphuring, while older vines require a great deal. About ten tons of sulphur will be enough for 160 acres.

Tying Over.—The tying over of the branches is another vineyard operation much used in the interior raisin districts, generally in the end of June or the middle of July. It consists in so bending and tying the long, straggling branches of the vine that they will shade the grapes hanging in the center. The long branch is bent, not in a direct line towards the center, as it would then expose too many of the lower grape bunches, but in a spiral direction round the vine. If there is any fear that the grapes will be exposed and sunburned, and the vines have not been properly summer pruned, the tying over is the only process by which great loss can be prevented and the grape crop saved. In tying over, no twine is used. The end of the long branch is twisted and fastened to other branches, and, when the grapes are ripe and the picking season comes, a single light pull will suffice to untie all and allow the grapes to be picked. Great care should be used in tying over, lest the lower branches become exposed and sunburned. Careless or inexperienced laborers will often accomplish a great deal of work and a great deal of harm in an incredibly short time. I have seen vineyards where more harm was done by tying over than by the sun and wind combined.

Covering the Vines.—Instead of tying over, many vineyardists now cover the vines, and place the covers on the open center of the vine, in order that they may protect the grapes from exposure to the sun, This is done in June, several days before the hot spell is expected. The last week in June is the best time almost everywhere in California, as the vines are then open in the center, and any unusually hot weather would easily cause the grapes to sunburn. The process of covering is very simple. With a pair of shears the longest branches are clipped off and immediately placed on the open center. This is generally enough to prevent the exposed grapes in the center of the vine from being scalded. More than half a dozen branches will seldom be required, and at picking time these dry branches must first be thrown off, so as to give the picker access to the grapes. The covering of the vines is a better process than tying over, requiring less work and being more quickly performed. It is especially useful for old vines, as the grapes of young vines are principally exposed from the sides.

Thinning the Crop.—The proper thinning of the crop should be done by pruning. If the proper amount of wood is left, no thinning out of the grapes is needed. If a few show-grapes or extra large raisins are needed for exhibiting purposes, they can be produced by a judicious cutting of the majority of the grapes from any single bunch. If the free half of the bunch is cut off, the part that is left will produce very large grapes. This operation is, however, never likely to enter as a regular vineyard operation in our vineyards, as with us labor is too scarce. The object of our raisin industry is to produce cheap medium-sized raisins of good quality, to be used by the masses of the people, instead of a smaller quantity of very large grapes, which could only be used by the rich.

Ringing the Vines.—This consists in removing a part of the bark all around a cane. In France and Greece a special instrument is made to perform this operation quickly and carefully. A ring of bark half an inch wide is all that is required to have the desired effect. The vines are ringed when the grapes are half grown, and only a few canes are ringed on each vine. The effect of ringing is to greatly increase the crop of grapes, also to produce the grapes earlier in the season. So far this process has not been used in California to any extent. In the Grecian Islands, where currants are raised, this ringing has been practiced for years, with more or less beneficial effect. The sap in the cane that is ringed is prevented from again returning to the root, and goes to produce a larger quantity of grapes above the ring. But thereby the cane is seriously injured, and often to such an extent that it must be entirely removed the following season. Care must therefore be taken to leave enough unringed branches to serve as fruit-bearing wood the following year. If done with care and good judgment, the ringing does no great injury to the vine. For a fuller account of the process, see article on Currants.

The Vineyard Labors of the Year.—The following synopsis of the various labors in a raisin vineyard can only be of interest to the beginner, or to any one who contemplates engaging in the raisin business. The data given are only approximate, as they must differ in different localities, or according to the changing of the seasons:

December.—After the first frost, or when the vines are dormant, planting new vines and cuttings may begin. Pruning the old wood. Burning the prunings. Manuring the soil.

January.—Plowing, cultivating and planting.

February.—Cultivating and plowing.

March.—Grafting the grapes and finishing plowing.

April.—Hoeing the vines and cultivating. Sulphuring and suckering.

May.—Sulphuring and summer pruning.

June.—Hoeing. Covering or tying over the vines.

July.—Irrigating where needed. Fixing trays and sweatboxes.

August.—Distributing trays and sweatboxes in the vineyard. Picking the first crop. Packing should begin as soon as possible.

September.—Picking, drying, turning the trays, reversing, taking up.

October.—Picking the last of the second crop. Packing continues.

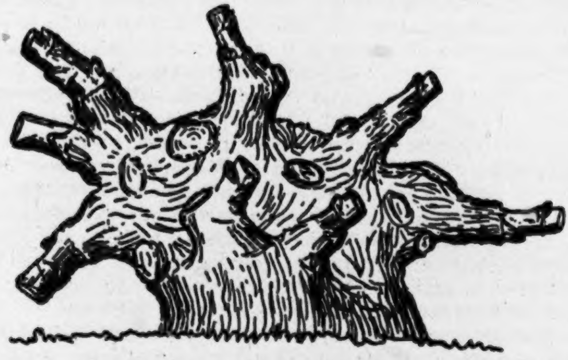
November.—Hauling in, stacking and cleaning off trays and sweatboxes. Irrigating and manuring the land. New land should be prepared for planting, which should begin as soon as the first frost has killed the leaves of the vine.

PRUNING.

Winter Pruning, or Pruning Hard Wood.—The pruning of vines comprises two different processes. The first one has for its object the shaping of the vines, the second one similarly the shortening of the branches properly so as to enable them to bear better fruit. These two points must always be kept in view, much more so of course during the first few years, before the vines have reached their bearing age. But even in after years the pruning must be so conducted, that the shape of the vine is not changed so as to interfere with the work in the field, or with the perfect development of the grapes. As regards the shape of the vine, it has been decided that in our raisin districts the Muscat requires to be pruned low, in order to properly protect the grapes from sun and wind. The head should be as low as possible, or even rest on the ground, and in no instance be more than a few inches above the same. Many of the bunches will then rest on the ground or hang a few inches above it, and experience shows us that such low bunches are the best and those which produce the finest raisins. Tall Muscat vines never produce as sweet and as large bunches or grapes as those headed low, and their grapes are apt to sunburn or be otherwise checked in their growth. During the first year, the young vine should be cut back to a single stem, it being enough to leave two or three eyes above the ground. The second season these canes should all be cut away except three, which are to form the future head of the vine. Each one of these may be cut to two eyes, thus leaving six eyes on the vine. In the majority of vines, the head should by this time have been formed, as the following year will be the first year in which the vines will bear.

When Muscat vines have grown two seasons, they should be pruned for fruit. The third season will always give some fruit, while, in many localities where the vines have been well cared for, the yield may be quite large and pay handsomely. No direction as to pruning, which will apply to every locality or to every vine, is possible. In different localities the climatic and other conditions are so variable that the methods of pruning may be modified. Where the vines grow strong and vigorous, more wood should be left. In cool and sheltered places the vines should be given a greater spread to allow more sun and air to enter. In warm localities, with a broiling sun, the principal object in pruning should be to properly shelter the grapes. There is danger, or at least there are great disadvantages in pruning either too long or too short, and in leaving too many or too few spurs. In pruning too long, or leaving too many eyes, the shape of the vine is changed or even seriously injured. In leaving too many spurs, the vines may bear too many and too small grapes. To find the medium between these extremes is always the great object and study to which the grower should devote his attention. In rich and moist soils which produce strong vines, more eyes should be left, and in sandy, poor soil a few eyes may suffice to cause the vine to bear much more that it can properly mature and perfect. The year before the vines bear their first good crop, the spurs left should not exceed three or four, and each spur should not have more than two eyes, including the eye nearest the old wood, which eye is often overlooked and not counted in. The next year a few more spurs may be left, but at no time should each spur be allowed to carry more than two eyes. If more eyes are left, the lower eyes will not develop, and the only thing attained by such pruning is to increase the size of the head, and to place the leaves and the grapes farther away from the center of the vine.

At the age of six years, or when the vine is in full bearing, no more spurs should be added, as the vine has then attained a mature age, and the yield will increase independently of an increased number of spurs. How many spurs should be left it is not possible to say. The experience with most growers is generally that too few spurs are left, and that from ten to fifteen spurs are not too many on large and healthy vines. The tendency of the growers is now to leave more spurs than formerly, and to always restrict the spurs to two eyes each. This experience has been acquired simultaneously in Fresno, San Bernardino and San Diego counties. Many growers affirm the fact that the difficulty is to get spurs enough, and my own experience is that, after the vine has once attained its age of full bearing, all the strongest branches are required to furnish spurs, and that only the weak and sickly shoots should be cut away entirely. The strong flow of sap in the spring requires many outlets, so as not to unnecessarily push the cell walls and cause disorders, and in case the soil is not strong enough to sustain and perfect so many grapes, it is better to manure it heavily and make it rich enough for all purposes. I believe an average of from eight to ten spurs are required by strong and bearing vines. Only strong canes should be left at any time. Weak and immature canes should be cut off close to the trunk or to the head.



Muscatel Vine Eight Years Old, after Winter Pruning.

This method of pruning differs materially from that this season adopted by A. B. Butler. He leaves now only from five to eight spurs on the vines, generally the lesser number. He maintains that his object is to produce large and superior grapes, and not to have his vines overbear. The outcome of such close pruning has not yet been demonstrated, but it may be possible that this is the proper way. Mr. Butler has certainly one point in his favor, and that is that it has not yet been demonstrated that very close pruning causes the disease known as black-knot, as quite frequently the unpruned vines show this disease much more than those which are pruned close. Another point in favor of this pruning is that it has been practiced in Malaga for years without any ill effects. But, before such very close pruning can be generally recommended, our experience in this direction should be more extensive, and several years more will be necessary to come to any satisfactory conclusion in this respect. We know, however, that too many (say from twenty to twenty-five) spurs will exhaust the low-headed Muscatel vines, and in order to bring such vines back to proper bearing it has been found necessary to reduce the number of spurs at once to one-third and then gradually increase their number as the vines grow stronger. Every grower should study his own vines and adapt the number of spurs to the quality of the crop. If the crop is inferior, reduce the number; if again the crop is superior, we may try to gradually give a few more spurs in order to reach the greatest yield of first-class grapes. In pruning the spurs, the cut should be made a little above the eye or bud, and not so close to it that it will be injured and dry out.

Suckers from the roots should be removed to a limited extent, that is, now and then a sucker may be left in order to give material for forming a new head, if this should be found necessary. But as a rule the many suckers which rise from the roots should be removed in early spring with a sharp-pointed stick, and even those which rise from below the regular head should be broken off while young, or be pruned off in winter time.

Another system of pruning called the Chaintre system has been introduced, or at least spoken of during the last few years. As, however, it is not generally used, or even to my knowledge used at all, for raisin grapes, I need only here allude to it. It consists of pruning the vine to one single long stem, which is carried along the ground and, at a distance of six or eight feet from the root, fastened to a stake. This branch is pruned to shorter branches and spurs, each of the latter to one or two eyes each to furnish wood and fruit. The advantages of the Chaintre pruning are claimed to be principally two,—a greater yield of grapes and a larger outlet for the abundant sap in the spring. It is supposed that, if the vine is pruned too short, the sudden flow of sap in the spring has a great tendency to poison some of the cells and vessels of the wood, and cause the disease known as black-knot. The Chaintre system endeavors, by furnishing the vine with more cells and vessels, and thus a larger outlet for the sap, to overcome this difficulty. The Chaintre system has, however, some great inconveniences. It interferes considerably with the tillage of the soil. It increases the cost of the vineyard through the extra stakes necessary to support the vines,—inconveniences so great that I doubt whether the system will ever be seriously adopted anywhere on this coast, even if it should prove of any advantage.

The time for the pruning depends upon the season. The only safe rule is that vineyards may be pruned as soon as the vines are dormant. If pruned too soon, a new growth will start, which will be killed by the first frost. In many seasons the pruning may be done in November and December; in large vineyards it must be begun early, so as to finish before the plowing commences. Early pruning will cause the vines to start early in the spring, while late pruning will considerably delay the starting of the buds. When the spring frosts are to be feared, the pruning may be deferred for some months, or until the end of January, as it delays the budding out of the vine in the spring, sometimes as much as fourteen days. But, on the other hand, the first warm spring weather is so favorable to the development of the grapevines and the setting of the fruit, that every advantage should be taken of the same. The very best crops are generally had on early pruned vines.

Bleeding of the Vines.—The bleeding of the vines after pruning in the spring is by many considered injurious. So far as I know, no direct experiments to prove this have been made in this country, but European experiments with wine grapevines point to no ill effects from the bleeding of the vines. The bleeding retards the budding out, and this fact has led some growers to the practice of pruning twice. In the first pruning an extra eye is left on every spur, and these eyes are again clipped off shortly before the eyes begin to swell in the spring. The bleeding of the vines thus causes the eyes to be retarded until the frost is over. I believe such practice is both unnecessary and too costly, and is not required in any of our raisin districts, and where such practice must be employed the raisin grape cannot be perfectly at home. Of late years spring frosts have become very rare in our principal raisin districts, and the practice of double pruning is no longer thought of.

Summer Pruning, or Pruning Green Wood.—Summer pruning is a much disputed vineyard operation, which, however, at least in some localities, is of great importance. This summer, or rather spring, pruning consists of cutting back the young growing shoots from one-third to one-half just after the berries have set well. The proper time of the year is in May, but the exact time must necessarily be different in different localities and seasons. In Fresno the cutting back should not be done later than May, and never except when the vines show a vigorous growth. The principal object the summer pruner has in view is to force the secondary branches of the vine as much towards the center of the vine as possible, so as to form there a perfect canopy of shade to serve as a protection to the young and tender berries. If let alone, the branches of the vine will throw out these secondary shoots near the top of the branches, thus leaving the head of the vine unprotected from the sun. The shortening in of the branches necessarily throws the new shoots to the center of the vine. A not less important object to be sought by the summer pruning is the strengthening of the young branch. In May, when the vines are covered by the young and vigorous shoots, they are yet exceedingly brittle, and only a slight pushing is required to break the branch off just at its junction with the old wood. A heavy wind at this time sometimes does an immense damage, and the vineyard will look as though every vine had been dragged over. Half of the branches may be broken and hang partially attached to one side of the vine. A single wind may ruin two-thirds of the crop. This can only be prevented by the summer pruning of the vines. By a heavy shortening in of the branches, the latter expose so much less surface for the wind to act on, that no branches are broken, and we have failed to see the heaviest wind cause any noticeable damage in vineyards which had their vines properly shortened in. The summer pruning in no way injures the vines. The sap is checked in its flow only for a few days, and within a week the new side shoots make their appearance. But the vineyardist must be careful not to summer prune after the hot summer weather has set in, as the hot weather will burn or scald the young grapes and ruin them entirely. For the San Joaquin valley raisin districts, I cannot advise summer pruning after the first days of June; in Southern California, somewhat later. Grapevines on sandy, dry and poor soil should not be summer pruned, or only very lightly so. They have not strength to start a new growth and will remain stunted all through the season.

Many growers of Riverside, El Cajon and Fresno consider summer pruning beneficial, if not necessary, and practice it every year regularly. It is necessary to summer prune heavily or not at all. Cut back one-half of the growth, or cut back leaving one or two leaves above the bunch of grapes on every cane. If the young canes are only topped, the secondary branches will come out near the ends of the canes and bear them down, in time exposing the bunches to the sun as well as causing the second crop to grow too far from the main trunk, the summer pruning thus acting the opposite of which it was intended. In Greece the wine grapevines are summer pruned, but the currants are never so treated.

Root-pruning.—The pruning of the roots of grapevines, in order to cause them to bear, is entirely unnecessary, and is never done by experienced growers. Some growers have practiced the cutting of the surface roots of the vines so as to cause the tap roots or the main roots to go farther down, and they claim that by this method greater crops are harvested. I am satisfied this is only a theory not supported by facts. Surface roots are as necessary to plants as deep-soil roots, and serve the plants in their way, bringing atmospheric air to the circulation in the roots. If too many surface roots are formed, it is a sure indication of too much water in the top soil, as too frequent irrigation with a small stream of water will cause such roots to form. The proper remedy is to irrigate less frequently, but more at a time. The above does not refer to the pruning of the roots of grafted vines. In cases where Muscats have been grafted on resistant stocks, it is of importance that the graft should not make roots of its own, as these would soon overpower the stock and in their turn succumb to the enemies which it was the intention to avoid. When rooted vines are planted in the vineyard, their roots should be well pruned, and all dead and decaying, as well as dried-up, parts should be removed. If they are allowed to remain on the vines, they will draw moisture from the sound parts at a time when all the moisture is needed for the formation of new roots.

Suckering.—The object of this process is to relieve the raisin-vine of superfluous wood before the latter has had time to draw on the strength of the vine and deprive it of the elements necessary to support the fruit-bearing branches. The proper time for suckering is early in the spring, when the young wood is yet tender and easily broken. With a hard and flat piece of wood, the lower suckers are dug out from below the ground, while the upper suckers may be broken by hand. A sucker must be understood to be any branch which does not produce fruit at a time when the vine is old enough to bear. In strong and moist soil and on strong vines even the lowest shoots produce grapes, and can therefore hardly be called suckers. But as a rule even they should be removed, unless we have a special object in view, such as renewing the trunk of the vine, lowering its head, or in otherwise encouraging the lower branches.

While few vineyardists take sufficient care and time to sucker their vines, there can be no doubt that the operation is of the greatest importance, in order that as large and good a crop as possible may be secured. It is not only best to remove all the non-fruit-bearing branches which spring out from the root and the trunk, but also a little later on, after the shoots have reached a foot or more, to cut any branch from the head of the vine which does not produce fruit. In many instances, however, it is necessary to renew the head of the vine, and for that purpose lower suckers may be allowed to grow. For a year or two these are pruned regularly and made to bear, and the old sickly head is then removed.

VARIOUS VINEYARD TOOLS.

General Notes.—It is not my intention to here describe the various tools used in the vineyard so minutely that they can be made after the description, but simply to enumerate and call attention to them in order that as little repetition as necessary may be made. Every local blacksmith or mechanic invents, improves or patents vineyard tools of every description, and almost every year sees new tools introduced and older ones discarded. Still a few of these tools have become standard, and modifications of them are not always improvements.

The Sheep's-foot.—This is a very useful tool in planting grape cuttings. It consists of a round rod of three-eighths-inch iron and about three and one-half feet long, furnished with a cross handle at the upper end. The lower end is very slightly flattened out and split to a depth of one and one-half inches, the cleft thus formed being a little wider at the point of the bar, while the interior angle of the cleft should be rounded in order that the cutting may not be cut. The sheep's-foot is used in very soft ground only, where it can be pushed down readily. In planting, the lower joint of the cutting is grasped by the cleft in the rod, and both are pushed down together to the required depth. A twist is then given the handle, so as to get the rod loose from the cutting. The rod is then pulled up, and a tamp with the foot sets the ground solid round the cutting. Care should be taken that the cutting is not pulled up with the rod, as it will prove fatal to the cutting.

The Planting Bar.—This bar is used also in loose ground free from rocks. It consists of a flat bar of iron two and one-half inches wide, from three-eighths to one-half inch thick and three and one-half feet long, and is furnished at the upper end with a handle. In using this bar, it is first pushed in the ground, and a hole is made for the cutting. The cutting is then pushed down into the hole, the bar inserted alongside of it and pressed forward, in order to fill the hole and set the soil solid around the cutting.

The Dibble.—This tool is simply a hard piece of oakwood, with a curved handle and pointed. It is a most useful instrument when the vines are being pruned. By means of it the soil is scraped off from around the trunk of the vine, to enable the pruner to cut off the suckers as close to the trunk as possible. Every pruner should be furnished with a dibble.

Planting Chains.—These are best made of twisted wire, such as is used for clothes lines. Lines made of cotton or hemp are apt to stretch when dry, and shrink when wet. Copper wires are inserted to mark the distances at which the vines should be planted.

Spades.—Spades are often used for planting. Long-handled spades are more useful than those with short handles.

Hoes.—Besides the common, heavy hoes, very useful hoes can be made of old shovels which are too worn to be of account as such. New handles are set on the shovel blades at a right or sharp angle, thus transforming them into veritable hoes. With these tools much more work can be accomplished than with the common, manufactured hoe, which never cuts well. The large, flat-faced Italian hoe imported to this country from Italy is a most admirable instrument when planting cuttings in nursery rows. In fact it is then indispensable.

Plows.—Of plows, heavy double plows for two horses are used for plowing in the center between the rows, and smaller plows for plowing closer to the vines. As these can be had everywhere, and as every grower has his own preferences, no description of them is required.

Cultivators.—These are indispensable in the vineyard, and various models are in use. The common, diamond-shovel cultivator for both one and two horses is indispensable in every vineyard. The larger one of these may be greatly improved by affixing to the posterior shovels a cutter-bar, which should stand horizontal and on a level with the center of the posterior shovels.

Randel Disc Cultivators.—These are useful in ground that has baked before the lately planted cuttings have begun to bud. They seldom cut or injure any of the cuttings, and the whole field may be gone over regardless of rows or cuttings.

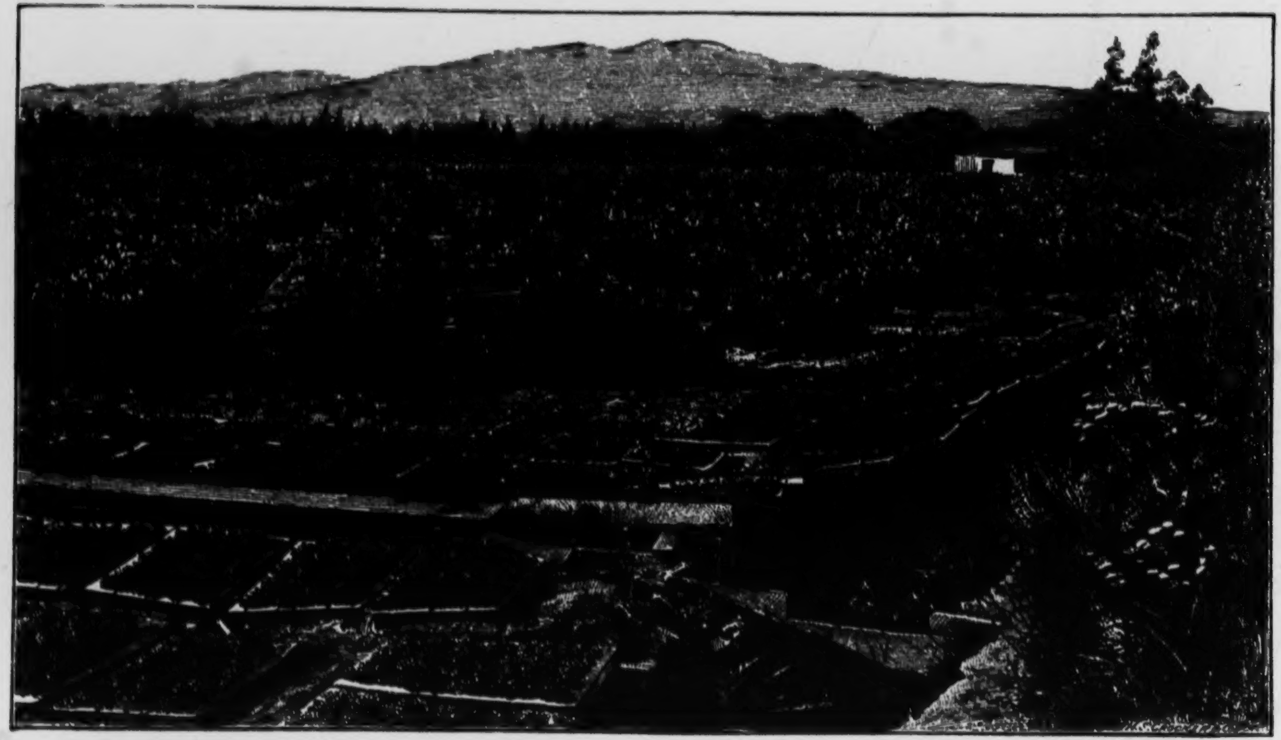
The Ash Trough.—The ash trough consists of a long trough on wheels, all made of galvanized iron, and furnished with numerous perforated holes. It is drawn by two or more horses through the vineyard, and the cuttings are burned in it as it goes along, and the ashes are scattered over the soil. As yet this trough is only used in a few of the largest vineyards, but when perfected will be useful everywhere, as by its aid the ashes may be saved for the vines instead of being wasted as is now so often the case.

Sulphuring Cans or Bellows.—These are of various shapes and patterns. The cans have been superseded by the simple little burlap bag, which does the same or better work. The bellows are similar to common bellows, but are furnished with a distributing nozzle and with an air opening through which the sulphur can be poured.

The Cutter-sled.—This is simply a sled four feet long by two and a half feet wide or more, under which has been fixed a horizontal bar of iron in the shape of a shallow U. It is used in the vineyard after the plowing and cultivation is finished, and when it is of importance to kill the few remaining weeds. The driver stands on the sled, which is pulled by one or two horses. It cuts all the weeds below the soil, and is a most effective and useful tool.

Vineyard Trucks.—These useful trucks are California inventions, and of the greatest importance to the grower. They are now made of various sizes, but should never be over four feet wide, while three feet is even better, and their length should not exceed six feet. They are made to turn readily anywhere by having the front wheels or wheel movable, independently of the balance of the truck. By the aid of these trucks the grower can use horse labor in distributing his boxes and trays in the vineyard, even where the vines are planted so close that ordinary wagons cannot pass. The vineyard truck is now used in all Fresno vineyards, and is considered almost indispensable. The first truck ever made for this purpose was designed and invented by J. T. Goodman of Fresno.

Shears.—These should be of the very best make of soft steel, and furnished with double springs. So far no good pruning shears are manufactured in this country, the best make coming from Switzerland, and retailed here at $3.00 per pair. It pays any grower to buy the best shears, as inferior ones not only last but a short time, but also do poor and slow work, and in the long run cost more than the best and most expensive make. With a good pair a pruner can in a day cut fifty per cent more than with a poor pair, and from ten to twenty-five per cent more than with an ordinary pair. It therefore can be readily seen how the extra price can be saved in the first day or two. Such fine shears should be handled and cared for very much like a razor. They should never be ground on a revolving stone, but only honed with oil on a fine hone. When the season is over they should be oiled, looked over and laid away. Large shears with wooden handles are not needed for Muscat vines. The best size shear is the medium size, which can be used with one hand.



Raisin-grape Drying at Riverside.

DRYING AND CURING.

CALIFORNIA SUN-DRIED RAISINS.

Note.—In describing the processes of drying, curing, packing, assorting, etc., I have followed only methods which should be used by every conscientious raisin grower and packer. These methods are now actually in use, not by every packer and grower, but by the best of them, by those who strive to produce a very superior article, which will compare favorably with and compete successfully with the best products of Malaga or other foreign raisin districts. Too much poor curing and packing is done in every raisin district, to the great detriment of the district, its growers and its packers. The cause of so much poor work is undoubtedly due to the method of selling the raisins in bulk for a previously fixed sum, whether the crop is good, bad or indifferent. For many years no inducements were held out to the grower to produce a very superior article, and as a consequence the packer got very little first-class raisins to pack. When raisins are paid for according to their quality alone, there will be plenty of first-class raisins, and both packers and growers will be the gainers. The former will get more first-class fruit to pack, the latter will find it to their advantage to produce it. During the last season (1889 to 1890), a change was inaugurated, and a grading of prices according to the quality of the raisins has been insisted on. When this system is fully carried out, and when the grower knows at the beginning of the season that he can get a higher price for his superior raisins, California will produce as high-grade raisins as Malaga or any other raisin district. Already now our average raisins are better than the average Malagas, and all that our growers ask for are inducements to produce the best. With a view to promote the attainment of these expectations, the following has been written. Raisins may be produced by cheaper methods than those which I advocate, but only great care, judgment and study will accomplish the best results. In the raisin industry it pays to produce the best, and to attain this very little extra care is required.

Time of Ripening.—Varying with different localities and seasons, the Muscat grape ripens in California between the 10th of August and the 30th of September. The earliest points where raisin grapes are now grown are probably Palm Valley in San Bernardino county and the plains of Kern county. In both these localities Muscats have been known to be ripe as early as July, but neither locality has yet produced any great quantity of raisins, and can hardly be considered as a raisin center. The earliness of the San Joaquin valley generally is probably caused by its small elevation above the sea, which is about three hundred feet for Fresno, and increasing as we go farther south. San Bernardino county again, somewhat later as to ripening, is, as far as its raisin centers are concerned, more elevated, or from one thousand to two thousand feet or more. The nearness to the sea has there also some influence to retard the maturing of the grapes, and it is certain that in Southern California the later ripening of the raisin grapes is principally due to this cause. Thus the picking in Riverside commences between the 10th and the 30th of September, and while the other raisin districts in the southern part of California may vary some, still the ripening season coincides very nearly with that of Riverside. In Highlands the grapes are said to ripen two weeks later than at Riverside. In El Cajon the grapes ripen between the 1st and 10th of September. In Fresno the Muscatel raisin grapes ripen in the end of August, and generally by the 20th of August the picking has begun everywhere on the drier soils, while on the wet soils it is generally retarded from one to two weeks. As a rule the dryness of the soil influences considerably the ripening of the grapes, and even the quality of the soil is not without some influence, as on sandy, warm soil grapes ripen much earlier than on heavy land. As an illustration of such early ripening, we may mention that, on certain gravelly soils northwest or north of Santa Ana, the Muscat grapes ripen two weeks earlier than on the heavier and finer soils in the immediate vicinity. The growers take advantage of this early ripening to sell their Muscat grapes fresh instead of drying them.

In Salt river and Gila valleys in Arizona the grapes are said to ripen much earlier than in California, but so far the vineyards there are not old enough to have been greatly benefited by this early ripening. On the plains of Kern county the ripening is hastened by the nature of the soil, and possibly also by the nearness to the desert and the desert wind, by the greater distance from the sea, and by a less amount of rainfall. In Malaga the grapes ripen several weeks earlier than in Fresno; in fact, the whole Mediterranean region seems to be earlier than California. As a general rule, we may state that the Muscat grapes ripen later in Southern California than in the central portion of the State. In regard to Sacramento and San Joaquin valleys, the farther we go towards the south the earlier do the grapes ripen. But in every district there are localities which are earlier than others. The Muscat and Muscatel ripen earlier than the Sultana, which latter grape begins to ripen earlier than the Muscat, but attains perfection much later than any other of our raisin grapes. Thompson Seedless ripens in Yolo about August 10th, and is thus our earliest raisin grape.

Signs of Maturity.—There are three different ways by which the ripeness of a grape can be tested,—saccharometer, taste or color. The saccharometer is a well-known instrument, consisting of a graded glass tube that will sink to different depths in liquors containing different percentages of sugar. There are different kinds of saccharometers, but the most practical one for the general raisin-grower is one divided in one hundred degrees, each degree showing one per cent of sugar to every hundred of water. Thus, if the saccharometer sinks down to twenty-five, we know that the water or must contains twenty-five per cent of saccharine water and seventy-five per cent of water. To properly test the grapes, a few bunches should be picked from several vines, the juice should be squeezed out and passed through a towel or otherwise strained. The must is then poured into the test tube, and the saccharometer inserted. If it shows twenty-five degrees or more of sugar, the grapes will make good raisins, but for very superior raisins several degrees more of saccharine are needed. It is not unusual to find the grapes reach thirty degrees in favored localities and in favorable seasons. Only inexperienced vineyardists will require the aid of the saccharometer to determine the state of ripening of the grapes; the more experienced judge by taste and color.

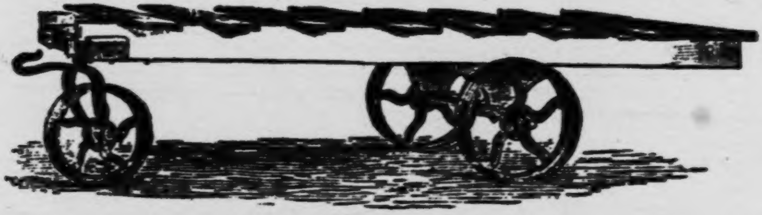
The taste of course is the most commonly used method for ascertaining the ripeness of the raisin grapes. Every grower experienced or not should examine his grapes repeatedly. To give directions for tasting the ripeness of the grapes is of course impossible; it must be learned, and can only be learned by practice. It is enough to say here that the grapes should taste very sweet, contain no acid, and if possible be rather solid.

The color is also a valuable adjunct in determining the ripeness of the raisin grapes. Fully ripe and perfect fruit should be amber yellow, somewhat transparent and waxy. If this color is combined with great sweetness, and in Muscatels with absence of acidity, we can be sure that the grapes are ripe. Some grapes do, however, especially when too much exposed to the sun, acquire the yellow amber tint without being sweet, but they are readily distinguished from the ripe grapes by their being of smaller size and harder, tasteless and acid. Such grapes never develop into good, mature grapes, and do not make good raisins. I may also remark that not all ripe grapes become amber colored. Those that grow in the shade and on very damp ground remain always green, although they acquire a certain sweetness, and will make good raisins. The Muscat grapes will make salable raisins even if not fully ripe, but in order to make superior and good raisins all grapes should be "dead" ripe, especially so if the grapes are to be dipped in lye. If unripe or partially ripe grapes of Muscats and Sultanas are dipped, they make very poor and red raisins; it would have been better if they had never been dipped. This is especially the case with the Sultana, which begins to ripen and is eatable long before the Muscat, but which only makes a good dipped raisin after the Muscat has been ripe for some time. Three or four days make a great difference sometimes in the amount of sugar in the grapes, and consequently in the quality of the raisins, and the experienced grower will keep his grapes on the vines as long as possible to attain the greatest possible amount of sweetness. But on the other hand it takes judgment to foresee how sweet the grapes will be, as in unfavorable seasons they will not attain their full sweetness even if allowed to hang long on the vines. To know the time after which the grapes do not increase in sugar requires much experience and acquaintance with the locality where they are grown. In this respect different years vary very much.

Picking.—Many vineyardists pick their raisins too green or before they are fully ripe. Not all raisins ripen at the same time, and to make the best possible raisins out of the grapes, it is necessary to pick over the vineyard several times, each time picking only the ripest grapes. In places where there are two crops of grapes, at least two pickings are absolutely necessary, and in many places two pickings are enough. The green grapes of the first crop are then left to be picked with the second crop, at which time they will probably be perfectly ripe and very choice. But if the vineyard is small and manageable, and the owner wishes to realize the most that he possibly can, he should make at least three different pickings, each time taking care only to pick those grapes which are fully ripe and which would make a first-class quality of raisins. As long as the smaller vineyardists sell their raisins in bulk at a contracted price of so much a pound for any kind or quality of raisins, we cannot expect any great improvement in the too common mode of picking, where good, bad and indifferent grapes go on the trays together. But I am certain that in a few years this will or must change. Raisins in sweatboxes will bring the price they are actually worth, and it will be to the interest of every grower to pick his grapes at the time they will make the best possible raisins, even if extra labor is required for the work. The pickers generally use small, pointed knives for separating the bunches, and they are preferable to small shears, as better enabling the picker to reach farther in between bunches and branches, and to cut the former without injuring the branch.

In picking the bunches, great care should be taken, much more than is at present in use. It is always best to begin picking in the poorest part of the vineyard, as it will take some time for the pickers to learn; they are almost certain to pick in the beginning too many green grapes. The poorest part of the vineyard is also apt to have the ripest grapes. The large, fine bunches should be handled with the utmost care, in order that the bloom of the grapes may not be injured. The bunches generally should be handled by the stems only, or, if this is impracticable, by the stem as much as possible. In separating a large bunch from the vine, the bunch should be cut as close to the stem as possible, and at the end of the stem of the bunch there should remain a portion of that broader part by which the bunch is attached to the main branch. There is nothing prettier on a bunch of raisins than this broad end of the bunch; it gives an idea of strength and oddity to the raisin cluster, showing the buyer at a glance that it is a cluster which was once solidly attached to the vine. Many raisin-packers place this broad end of the bunch so as to protrude above or between the berries, as if inviting the purchaser to take hold of it and thus lift the luscious bunch out of the box. With the poorer and smaller bunches, no such care in cutting need be exercised, and it would be to no benefit to so cut a small, poor bunch that it would cause the purchaser to belive it was a large bunch. Poorer bunches might therefore be cut with short stems. As to the handling of the bunches, the intelligent grower will soon learn how to instruct his men. If vine branches interfere with the lifting of the bunch from the vine, some of them may be cut without any injury to the vine, but too many branches cut this way will cause a new growth to start, which often is derived from the best fruit buds for the ensuing season, and which always is apt to be injured from frost.

A picker should average not less than fifty trays a day of cleaned and assorted grapes. At this rate the picking of twenty pounds of grapes costs about two and a half cents. Some persons employing white labor claimed to have lowered the cost of picking to one and three-quarter cents per tray of twenty pounds, but I failed to learn how these grapes had been handled, cleaned and assorted. The picking of the grapes is facilitated by previous care given the vines. Neglected and entangled vines are much more difficult and expensive to pick than those which have been properly cared for and correctly pruned the season before. The same may be said as regards vines between the branches of which weeds have been allowed to grow. In picking from such vines, the grapes are always torn, the best bunches destroyed and many grapes wasted on the ground.



Raisin Vineyard Truck.

Cleaning.—When the bunch is picked or cut from the stem, it should be cleaned. If it is a first-class or even an ordinary layer bunch, every sunburnt berry, every leaf, twig or other conspicuous foreign substance, must be carefully removed with the picker's right hand, while the left hand holds the bunch by the stem. This cleaning must some time be done, and at no time can it be performed with better results than when the grapes are green. The stems are then soft and flexible, while later on they are brittle, and in endeavoring to remove foreign substances many berries will be detached, or sometimes even the whole bunch broken. This cleaning of the bunch does not need to extend to third-rate or small bunches, which are to be used for loose raisins. The latter can be cleaned very rapidly with machinery, and it would only be a waste of time to clean them by hand-picking. The use of a pair of bellows is also very practical. With them much of the spider webs and smaller refuse can be removed, which could not be gotten rid of in any other way. A few hands should therefore go over all finer bunches and blow them clean, especially if sand or dust have accumulated on the trays or bunches. If the grapes are carefully assorted when picked, and the different grades placed on separate trays as they should be, this cleaning is done rapidly, as the largest part of the crop, which only will make loose raisins, need not be cleaned.

Drying on Trays.—As soon as the grapes begin to ripen, the trays should be distributed along the rows in the vineyard. They may either first be placed in piles at every row where the roads cross the vineyard, or at once distributed along the vines. The former method is to be preferred, as it protects the trays from dirt and dust, and in distributing afterwards it gives the pickers a more varied labor, often welcome as a change from the cramped position necessary in picking. Muscat vines in proper bearing require one or two trays to the vine, while for young vines one tray will suffice. The probable quantity needed should be ascertained beforehand in order that the trays may be properly distributed. The ripe grapes are always placed directly on the trays, and not previously picked in boxes. In placing the bunches on the trays, the proper way for each picker should be to have two trays, one for each grade. On one tray he places all the large bunches that promise to make first-class bunch raisins; on the other tray he places again all inferior bunches and loose berries. The smaller bunches and loose berries may be placed any way almost, as long as they are not heaped on top of each other. The largest bunches should be placed with the stem side down, as this side will, when cured, become the finest and will eventually by the careful packer be placed upwards in the box. That part of the raisin which in drying touches the tray will also present, when cured, a flat surface with several concentric layers, which are considered a prominent feature in the perfect raisin.

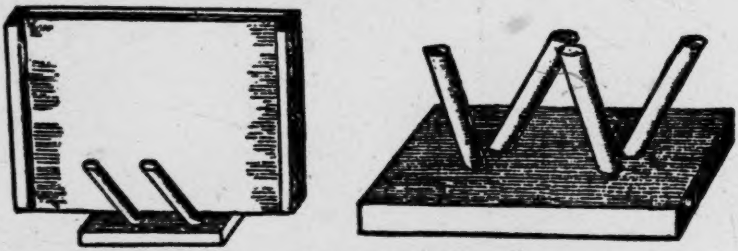
The general method of drying is, however, to place good, bad and indifferent bunches together on the same tray, with no attempt at assorting. While this method may do when superior raisins are not required, and when no higher price is paid for better grades, it will be found a very inferior practice when the grower desires to pack himself, in order to reap all the benefit he can out of his crop. For all superior raisins, I therefore strongly recommend the assorting of the raisins on the trays as having the following advantages. It requires less handling of the large bunches. The large bunches dry the slowest, and by having them from the beginning separated from the small and the loose the latter can be brought away to the sweatboxes, when ready, without necessitating the reassorting and handling from the trays, which at this time, when the stems are very brittle, is always expensive as well as injurious to the fine bunches. The larger bunches, which are to produce layer raisins, require less drying, as they are to be sweated or equalized before being packed. The smaller and inferior bunches, on the contrary, must be stemmed and assorted by machinery before they are equalized, and immediately after they are taken from the trays. In order to "stem" readily these raisins must be rather overdried, as if soft they would tear from the stems instead of having the latter broken. We can therefore perceive the advantage of having the two grades on different trays. Without the necessity of assorting we can simply take up our "layer" trays when they are ready and allow our "loose" to remain as long out as necessary, without fear of having the layers overdried. By this assorting when green, each grade can be treated separately in a quick and effective way.

A tray two by three feet may be made to comfortably hold from eighteen to twenty pounds of grapes. The first crop should be placed pretty close on the trays, not allowing any part of the tray to be visible, as the reflected heat will be too great and may injure the raisins. The second crop should be packed less close, as the reflected heat from the surface of the tray will help to dry the grapes. This of course only refers to localities where the temperature during the first drying is very high. The warmer it is the closer should the bunches be packed on the trays, and on the contrary when later on in the season, or when the drying weather is unfavorable, plenty of space should be given the grapes. It is often said that grapes, to make good raisins, should not only dry, but cure. There is much truth in this. Good raisins should dry and cure at the same time, by which is meant that a chemical process is taking place, which is something else than the mere evaporation of the water in the grape. The heat necessary and favorable for drying the grapes is different in different localities. At certain temperatures the raisins will get cooked and spoil, assume a red color, lose their sweetness, become sour and hard, and covered with large, sharply defined corrugations,—signs of a very inferior or even entirely worthless raisin. In Riverside the grapes are said to cook at from 98 to 100 degrees Fahrenheit in the shade. In Frenso the grapes dry and cure well up to a temperature of 105 degrees, and in El Cajon they do not spoil until 103 degrees are reached. I would think that from 90 to 103 degrees in the shade would be the best temperature for drying perfectly ripe and sweet Muscat grapes. When the grapes are very ripe, a much higher temperature will not injure them, while unripe and sour grapes, especially of the second crop, will burn or cook at a lower temperature than would be the proper one for ripe grapes.

It is not always advisable to stop picking when the heat becomes too great. A better method is to stack the trays in the field, so as to protect the raisins from the sun. When the heat subsides, the trays are again spread. The expense and trouble of stacking the trays is not as great as may be supposed, and a few hours will generally suffice to stack a large vineyard with the regular picking gang. Some packers have suggested that to secure good raisins the trays should be stacked for several weeks in the beginning of the period of drying. For the production of our usual dark-colored raisins this is not necessary nor even advisable, except when the heat is such that the raisins would cook and spoil. With a little experience this cooking of the grapes can be readily detected by the smell emitted by the grapes. As soon as they are in the least injured by the heat, a cooked flavor begins to pervade the whole vineyard. When this peculiar flavor is noticed, and when the berries begin to show small red and soft blotches on the side facing the afternoon sun, the stacking should be commenced as quickly as possible. If the trays are kept in piles for several days, the injured grapes will partially recover and at least to some extent regain their color. Greatly injured grapes will dry much slower, sometimes remaining several weeks behind those which were not injured by the sun. Slightly discolored raisins may partially regain their color by sweating, but they will not improve otherwise.

After the trays are filled with grapes, the best way is to put several rows of trays together, or rather to place the trays from three rows of vines along one of the spaces between the rows. This gives more compactness to the crop, makes it easier to handle the trays, and facilitates the stacking of the trays, their turning and reversing, or any labor with the trays that may be required. By thus clearing some of the spaces between the rows, admission for trucks and wagons is had close to the trays.

Turning.—After the grapes have been exposed to the sun for some days, they must be turned. By this time it will be found that the grapes have dried principally on the upper side, while the lower side is yet comparatively green. The time when the turning of the grapes should be done depends entirely on the weather. One-half of the drying process should be over, and this requires a longer or shorter time. When the time for turning is at hand, it will be found that the under side of the grapes, or rather the side of each berry that was placed against the trays, has flattened out and shows concentric circles, which are considered of much beauty, and greatly valued in all good raisins. When they are well formed and established, it is generally time to turn. If the grapes are turned before these concentric circles are hardened, the latter will open and become less distinct. Another objection to turning too early is that the upper side of the grapes, if not properly dried before turning, will dry but very slowly afterwards, and often so slowly that the raisins may have to be turned a second time, which will prove both expensive and to the disadvantage of the raisins. One turning is always enough, and the only one proper. There are several ways to turn. The Malaga grower, with his raisin floors, must turn his raisins by hand. The great advantage of our trays is that we can turn much quicker. The turning is done in our vineyards by placing one tray on the top of another and then turning them quickly over, when in changing the tray the bottom side of the bunches will be found to be up.



Raisin Tray Catcher.

This turning, however, requires some little knack, so as not to drop any raisins on the ground. The trays may be turned either the short or the long way. If the long way, one tray is first placed on the top of the other, and two men catch hold of the long opposite sides of the trays by placing their hands on the outside quarters of the edge and then pressing firmly. This keeps the raisins steady between the trays, and in turning rapidly, if the bunches are at all entire, few or no raisins will be dropped. In turning the short way, the men grasp with their opposite hands at the middle of the short sides, while with their other hands they catch the outside quarters of one of the long sides. By turning quickly over the long side that is held by the hands of the turners, the operation may be performed without dropping any berries. In small vineyards, where the owner must perform the work alone, he may turn the trays without any help whatever, though, naturally, his work will be somewhat slower. He can operate by the aid of a small contrivance called the catcher, a most simple but very effective little tool. It resembles a miniature stool like those used by the milkers of cows. The seat or top may be twelve inches long by six wide, made from one-inch lumber. On one side are inserted four pegs, each about six inches long. The two opposite ones are inserted very close together, but spread strongly outward. After one tray has been placed on the top of the other, the catcher is pushed over the long edge of the trays, which of course will cause them to jam tightly together on that side. By now grasping the trays on the opposite edge, they may be turned without the aid of any one else, and without any loss of raisins. Some use steel clips for the same purpose, but the common home-made wooden catch is undoubtedly the most practical method, as it is the cheapest.

Turning should, as much as possible, be done in the morning or at least in the forenoon while the air is yet cool and the stems of the raisins damp. The pressure of the tray will not then cause the stems to break off and the quality of the raisins to be lowered. If the bunch raisins are on separate trays, which is best, they may be turned earlier in the day than the second grade, which is not apt to be greatly damaged by the breaking of the stems, as they are to be stemmed anyhow.

Reversing.—This is an operation not properly understood by every raisin-grower, but is still of the utmost importance, especially for the first-class bunches of the first crop, which naturally dry more slowly than the smaller bunches. But the method is also very useful for the second crop, when late in the season the drying is slow and uncertain. The reversing consists simply in reversing the trays on the ground in such a way that the edges which first faced the north afterwards face the south, or *vice versa*. The object of reversing is plain. It will nearly always be found that the raisins at the top or on the side of the tray nearest the north will dry much more slowly than those on the side facing the south, especially so as soon as the weather begins to turn colder. To prevent this and insure equal drying at the top and bottom, the reversing is performed after the trays have first been turned. This will enable the grower to get his raisins in several days sooner than he otherwise would. Indeed, at the critical period of drying, when fall rains may set in and injure the raisins, it is of the utmost importance to hurry the crop as much as possible; the reversing is at this time almost as important as turning. I have seen the second crop of many a vineyard seriously injured by rain, and its drying delayed only through neglect to reverse the trays. The effect of reversing is oftentimes very striking, and one grower who reverses his trays in time may get his crop in safely, while his neighbor who neglects reversing may lose a great part of his. A few days' delay at this time of the year is often fatal to the whole second crop, and no pains should be spared in order to hasten the drying by every possible means available.

Slanting the Trays.—The practice of raising one end of the tray higher than the other is of very questionable value. In the fore part of the drying season, the heat from the sun is such that the raisins receive all the heat they require without being raised at an angle against the sun. Towards the end of the season, I have found that, when the trays have been raised, those grapes which lie on the lower edge of the tray, and accordingly nearest to the ground, dry the quickest, while those at the upper edge dry considerably slower. The cause is that the air a foot above the ground is much cooler than close to the ground; the large space under the raised tray also serves as a cooling room to cool the tray. In some direct experiments made, it was found that, as regards the tail end of the first crop, the raised trays came in several days later than the trays which had remained flat on the ground. In advocating that the trays should not be tilted, I must not be understood to mean that it is not beneficial to keep the tray in a tilted position when there is a close background to sufficiently heat the air equally at the upper and lower end of the trays. This can only be secured by either placing the trays against the side of a hill or on specially prepared drying floors, which are described further on. In this connection I may suggest that when the heat of the sun is not great, and when the raisins dry slowly, the placing of an empty tray behind the drying tray, in order to reflect the sun on the raisins, will considerably hasten their drying. This is a valuable aid in drying, especially when the second crop is late.

Elevating the Trays.—The practice of elevating the trays containing the tail end of the second crop is a good one. The best way is to place the trays on the top of the vines, when it will be found that the free circulation of air underneath will help to dry the raisins and prevent rot and mold. This method is only adopted after fall rains, but is then of great help in drying the crop.

Stacking Against Rain and Dew.—The stacking of the trays is also a valuable help in keeping out dew and cold. Late in the season, when it takes several hours of sunlight to dry the night dews, the stacked trays will be dry when the first rays of the sun are out. When heavy rains are expected, the grapes, whether partially dried or not, should always be stacked. It will keep the stems from rotting off from the berries, and will generally save the crop from being seriously injured. Some growers have an idea that only the partially dried grapes should be stacked, but the green ones are equally benefited.

There are several ways of stacking. The flat-stacking is used principally when the raisins are very dry, and when it is of importance that no air should enter the trays. In flat-stacking, one tray is simply placed on the top of the other, and the circulation of air thus brought to a minimum. In rainy weather, however, the roof-stacking is to be preferred. Instead of placing one tray on the top of another, the trays are placed in two piles joining each other in such a way that the inner end of every tray overlaps the edge of the tray in the adjoining pile. This lifting up of one edge of the tray gives to the whole pile a roof-like appearance, and the angle in which the trays join together becomes steeper the higher the pile grows, until, at the height of three or four feet, the trays slant so much that the raisins cannot rest on them, but are in danger of sliding off, when, of course, the pile should not be made any higher. It takes several times longer to stack the trays in roof fashion than to simply pile them up flat. The advantage of roof-stacking is that it admits more air, and sheds the rain better. In damp weather the piles should not be covered on the sides for any length of time, as the raisins will then mold more rapidly. If, instead of joining two piles of trays, three piles are made to join, the center stack will be flat, while much air is admitted to the raisins. In this stacking the first two trays are placed flat on the ground at almost the distance of one tray. Another tray is made to rest on the inner edge of the lower trays and cover the intermediate space, and so on. This method gives twice as much air space between the trays as regular flat-stacking, and is to be recommended when the weather is damp. A combination of this last method and roof-stacking is used by some, every grower almost having his favorite way to stack. It must be remembered that in very rainy weather no kind of stacking will be of any value, while, when the showers are few and far between, stacking may save the crop.

Stacking is especially valuable in conjunction with dryers, when protection during a few days only is all that is needed. One man can stack about five hundred trays an hour, and the regular picking gang can stack a whole vineyard in a few hours. Should the rain be very heavy and no dryer handy, it is of no use to try to save the crop after the mold has begun to make its appearance, and when the berries have begun to rot. It is then far better to dump the whole crop in the field rather than to spend time, money and anxiety on raisins which must in any case become a total loss.

Taking Up.—When, at last, the raisins are sufficiently dried, they must be taken up as quickly as possible. This process again consists of three different labors,—the stacking, assorting and boxing. It is of great importance to know exactly when the raisins have sufficiently dried to be ready for the sweatboxes. This can properly only be ascertained by experience, still a few directions will materially help the inexperienced grower in his judgment. A perfect raisin should be neither too hard nor too soft. A raisin is too soft when, after rolling it between the fingers, the least particle of juice exudes through the cracked skin or meat. Such raisins will "sugar" in course of time, and not keep a year. If the raisins, or a majority of them, on a bunch are too wet, they should be spread to the sun for some time longer. If, however, there are only a few underdried raisins in a bunch, the bunch may be taken in, and the soft raisins clipped off afterwards. A raisin is too dry when, in pressing and rolling it between two fingers, the pulp does not move readily inside the skin. Such overdried raisins will not again become first-class raisins; their skin will always be tough, and their color will be somewhat inferior. If but slightly overdried, they may be brought out by equalizing. To know when the raisins are in a proper condition to take up is most important to every raisin-man, and he should never neglect to watch his trays early and late. Upon his good judgment and watchfulness depend the quality of his crop.

To prevent too rapid drying out after the raisins are nearly ready, the practice now is to stack the trays in the field.

This stacking simply consists in placing the trays which contain the ready raisins on top of each other, in piles five feet high. On the top of every such pile are placed several loose trays crosswise, so as to shelter the pile from the sun, and possibly even from rain, and other trays are raised up against the sides of the pile in order to exclude as much air as possible. If, however, the raisins are rather underdried, the side trays may be left out so as to allow the raisins to dry more. It is always best to stack the trays before the raisins are fully dried, as they will finish drying and curing in the stack much better than in the sun. The underdried raisins will thus dry just enough, while the overdried ones, or those just right, will not dry much more.

After the stacking is done, the assorting is in order. This consists in taking out every bunch that is not sufficiently dried to go into the sweatbox, and placing them on new trays to dry more. At this time, also, the bad or inferior and red berries may be taken out, if present in a very large quantity on good bunches; but when there are only a few on, it is better not to touch the bunch, as, in handling it, it is only too apt to break. Any further picking out of bad berries had better be deferred to the packing-house. The boxing and assorting, which may be considered together, consist in transferring the different grades of the now dried raisins to separate sweatboxes. This is done in two ways. The number one bunches, which have been placed on separate trays, may now simply be slid into the sweatbox, by a dexterous movement of the tray. Between every two layers of these first-class bunches should be placed a stout manilla paper cut so as to exactly fit the box. It is of importance to have the paper just fit the box, and not be too large nor too small, as in either case the raisins are apt to become mixed and the bunches broken. But, if the grapes have not been assorted from the beginning on separate trays, more work will be required to get them into the sweatboxes. Every bunch must be carefully taken up by hand from the tray, and then placed on the paper in the box. But in doing so many bunches are necessarily broken, as even careful hands cannot help frequent mishaps, while ignorant and careless workmen may do an immense injury to the crop. Too few manilla papers are generally used. Some packers require only two papers in every box, while six or eight, or at least five, papers should be the proper number for every box of very choice or even ordinary layers. We must remember that, the more papers we use, the less apt are the bunches to be injured, but even the best layer bunches will not suffer if placed two layers high between every paper. On top and in the bottom of every box must be one paper, so as to keep out dust. The loose and inferior raisins, which either have been left on the tray after the layers are picked out, or which from the beginning have been placed on separate trays, may now, when perfectly dry, be simply dumped in sweatboxes without any paper.

We have thus at least two kinds of sweatboxes. One kind contains those raisins which are destined to make layers, and which require sweating and equalizing before they can be packed. The other kind contains the loose and drier berries, which are to go immediately to the stemmer and grader, and which would not separate from the stems if they were made to equalize.

Covering.—If the weather has been favorable, the raisins may have been dried and cured in twelve days. Of these twelve days, the first seven or eight were used for drying the upper side of the raisins. On the seventh or eighth day they were turned, and on the twelfth day they were ready to put in the sweatboxes. But this is fast drying, and drying under favorable circumstances, with a dry wind blowing gently all the time. But sometimes it takes a much longer time to dry, say from fourteen to twenty-one days. In Fresno, where the weather is less favorable, the drying of the first crop may require from two to three weeks. In El Cajon it always takes two or three weeks for the raisins to dry, and in Orange county the drying sometimes requires from thirty days to five weeks. In Malaga the drying is accomplished quicker than in California, because there they cover the raisin floors every night with canvas, and in the morning, when the canvas is unrolled, the raisins are yet warm. The drying, then, has been continued all night, and the raisins have not had time to cool when they meet the first rays of the sun. In California, again, our raisins are cold, possibly even wet with dew or rain, and it sometimes takes the sun until noon to dry up the moisture accumulated through the night.

To counteract this absorption of moisture, many of the raisin-growers in Orange county, California, especially around Santa Ana and McPherson, cover the trays with canvas every night. This method is to be recommended wherever there is any difficulty in curing either the first or the second crop. If this method is employed, I am satisfied that raisins could be grown and properly cured in localities where otherwise no raisin cult is possible. The method of covering the raisin trays at Santa Ana is as follows, varied by different growers, but in the main the same everywhere. The trays are placed together in long rows; about twenty yards long is found to be most convenient. The width of the row is just the width of two trays, or five feet. Thus the row of trays laden with raisin grapes is about sixty feet long by five feet wide. Along the north end of this long row of trays are driven down small posts every six or ten feet, and left extending about two feet above the ground. Along the south side of the row of trays smaller posts are driven down at the same distances, but not allowed to extend so high above the surface of the soil. These pegs or small posts may best be slanting outward, or from the trays. Along the high posts is strung a wire in such a way that it cannot easily get loose. To a long canvas cover are now secured small rings for running on the wire, and on the other side larger rings to hook over the smaller posts in front. If the canvas is only one yard wide, two widths must be sewed together so as to make the canvas six feet wide. The trays, which are two and one-half feet by three feet, when placed side by side will just form a drying floor of five feet, large enough to be covered by the canvas six feet wide. The cost of canvas is six and one-half cents a yard by the bale.

The manner of using the canvas is very simple. The canvas cover, which is stationary, is attached to the wire and the higher posts. Every evening the cover is thrown over the trays, the front or lower edge is hooked by the aid of the rings over the pegs in the ground, and the trays thus securely sheltered. In the morning, when the sun is up, the cover is thrown back over the higher posts, and the trays fully exposed. The trouble to cover is not very great; two men can cover forty tons of grapes in half an hour, and generally it is considered that the picking-gang can cover the whole crop in half an hour's time every evening, and it takes them as long to uncover in the morning. If well cared for and properly dried, and stored away in the autumn after the crop is all in, this canvas cover, with its posts, will last six or seven years, and if painted or oiled would probably last still longer. One yard of canvas can cover thirty pounds of grapes, and for the purpose of utilizing the full space, the trays are made two and one-half by three feet.

Such is the process practiced in Orange county. If adopted elsewhere, it would enable many localities to produce good raisins, where the climatic conditions are such that no drying is now practicable. The process is not as good as the one employed in Malaga, but it has some advantages which make it very acceptable. It enables the grower to use trays, and it makes drying-floors unnecessary, and the spaces in the vineyard can be used without taking away room from the vines. On the other hand, the drying-floors of Malaga are warmer and more secure, and almost absolutely safe in case of rain.

Drying-floors.—While, in some parts of California, the first crop dries generally without any difficulty, in other parts rain and dew very frequently interfere with the drying of even the first crop. In many places where raisin-curing is not successful, the same could be practiced profitably if we would adopt the system of drying-floors used in Spain. Even in localities where the first-crop raisins dry well, the second crop is always exposed to more or less rain, and the raisin-grower annually loses large sums of money on account of not being able to hasten the drying of the second crop. But it is doubtful if the Malaga drying-floors will ever be found practical and come into general use with us. They take considerable space from the vineyard, and are very expensive, but they are very secure, and when once built are very profitable. A limited number of such floors would be very useful in every vineyard, especially for drying the second crop. At present no such floors exist in this State. The following description gives an idea of how they may be constructed:

These drying-floors may be built of brick with the long sides as long as required, while the short sides should be about twelve feet long. The back wall is six feet high, while the front wall is only six inches high, which, with the above length of side wall, would give enough slope. In Malaga the interior is filled with black gravel and tamped hard, but for our purpose probably nothing would be superior to asphaltum, bituminous rock or cement. It must first be ascertained if bituminous rock would not impart a flavor to the grapes, in which case cement would be the most useful flooring. In order to allow the rain to run off, the front wall should be pierced with small holes close to the ground, but this would only be necessary in case the bed is filled with gravel, or no cement floor exists on top of it. Along the back part of the floor should be set a row of uprights of two by four lumber, driven securely in the ground. On the top of each post is set an eyelet, through which runs a stout wire along the whole back of the frame. A canvas cover long enough to reach the whole length of the floor should be used for covering, and, in order to secure it to the wire and the posts, it should be hemmed and furnished with small rings to run on the wire. In front similar rings are set in order that the canvas may be secured to the smaller posts and kept down in case of wind. On such floors common trays may be used. To make the canvas impervious to rain, it may be painted with boiled linseed oil. The above are only suggestions based on the Spanish drying-floors. For a full description of them, I beg to refer to the article on Malaga. In using linseed oil, care should be taken that only pure oil is used. There is linseed oil which contains chemicals which rapidly rot the canvas.

Dryers.—The subject of dryers is of great importance to the California grower. The last few years have fully demonstrated that every raisin vineyard, no matter where it is situated, should have one or more dryers, in order that the last of the crop may be dried properly when the rain sets in. Many years these dryers are not required, but from time to time they prove of vast value, and if properly constructed are much superior to any drying-floor. But so far no perfect dryer has ever been constructed. Most dryers are too expensive, costing from three thousand to seven thousand dollars, when of a capacity to dry from twenty-five to fifty tons of green grapes at one charge. Nearly all late dryers are constructed with a fan, which sucks the air out through one end of the building. The large complicated dryers are all patented, but there can be no doubt that good small dryers might be constructed by every grower, which will do good service. As, however, so far no very perfect dryers have ever been constructed, and as every owner of one changes and rebuilds every year, we must leave the consideration of the construction of these dryers to some future time when more knowledge or experience will have been gained. Dryers large enough to hold a charge of one ton of green fruit have been constructed at the price of two hundred dollars by Ellwood Cooper of Santa Barbara. They dried their fruit in twenty-four hours, but they were never used for raisins.

But as this style of dryer may be adapted to raisins, I will give a few hints at its construction. The heating apparatus consists of a large iron drum, or radiator, seventeen and one-half feet long by two and one-half feet wide, set on a furnace in which is burned wood. The furnace and radiator are built into a bank, on top of which the dryer is built. This dryer is simply a large wooden box about seventeen feet square and six feet high, and looks, as seen from the outside, like a chest full of drawers. These slide on frames, are deeper than they are broad, and contain movable bottoms or trays made of small redwood ribs. They begin about two feet from the top of the radiator; if closer, the heat would be too strong for the fruit. The ventilation is had by small sliding doors at the bottom of the chest, through which the air rushes in, while it goes out through the drawers, which for this purpose are left open an inch or two. The chest is covered over with an open shed, which makes the labor pleasant, and enables the attendant to inspect any drawer at any time without seriously disturbing the heat of the dryer. The cheapness and effectiveness of such small dryers are such that every one can afford them. A dozen such small dryers all set in a row in a bank could be attended to by very few hands. They would also be preferable to very large dryers on account of the short time required to fill them, and their raisins can be dried long before a larger dryer has been filled.

As to the usefulness of steam or fire dryers there can be no doubt. The idea is not to entirely dry the raisins in them, but only to finish up the raisins when, on account of unfavorable climatic conditions, they do not dry any more out-of-doors. The question as to which are best, "machine-dried" raisins or those dried in the sun, is entirely unimportant. No one would think of drying raisins entirely in the dryer, as it would not pay. Raisins properly finished in the dryer are not inferior to those entirely sun-dried.

Sweatboxes.—The sweatboxes should be made of strong lumber one inch thick. The length and width should be according to the size of the tray, and always one inch larger every way than the tray, in order that the raisins may be let down readily, or that they may receive a tray. The height of a sweatbox should be from six to eight inches, no more, as a greater depth will make them too heavy to be handled with ease by two men. Six inches in depth is better than eight. In order to secure the box and prevent it from splitting, the sides should be bound with hide, iron bands or with twisted galvanized wire. The latter is the strongest and best, costs the least, and is the easiest to put on.

Trays for Drying.—The tray consists of a wooden frame made of well-dried half-inch lumber, nailed to cleats of one inch by one and one-half inch and of desired length. The lumber most commonly used is well-seasoned spruce. Pine, if not well seasoned, is apt to give the raisins a taste of the wood or of rosin, while redwood may discolor the raisins if exposed to rain or very heavy dew. But as the lumber attains age, it also becomes less injurious to the grapes. Cottonwood or poplar-wood, which can be obtained in some places, make most useful lumber for trays, as they do not contain any taste or other substance apt to injure the raisins. The size of the tray varies according to the idea of the raisin-grower, but the size generally adopted is two by three feet. Formerly a smaller tray was used, but no smaller ones are now made. A larger size, three by three feet, is used by several growers, but, while it has the advantage of holding more grapes, it is also less readily handled than the smaller tray. In the southern part of California, a tray two and one-half by three feet is very popular. The tops of the trays are bought in the shape of shingles, which should be well dried before being nailed, as they will otherwise shrink up and cause cracks to form in the tray, greatly to the detriment of the drying of the raisins. Loss is also caused by loose raisins dropping through such cracks. The cleats should be wet or green, or they will split in nailing. If too dry, they should be soaked in water over night or for a few hours. The shingles should be planed on the side which is to be placed upwards. The cost of the lumber for the trays varies from nine to twelve and one-half cents in the shooks. For nailing the trays together, a frame is made of wood and iron. The cleats are placed on the two short, opposite sides, with a heavy bar of iron immediately underneath so as to clinch the nails. The planed shingles are then placed on top and nailed to the cleats with round-wire nails, which clinch automatically on the lower side as soon as they strike the iron bar. No cleats are required on the long side of small size trays; but if a larger tray is used a bar on each side may be required to give the tray sufficient strength. A good workman, after a few days of practice, can comfortably nail up four hundred trays a day. When the season is over, every tray should be nailed up and washed, or at least swept clean and stored dry. The age of a tray, if cared for, is about ten years.

CALIFORNIA LYE-DIPPED RAISINS.

General Notes.—In California the dipping of raisins in solutions of lye is yet in its very infancy, and I do not think that in the whole State over ten tons of lye-dipped raisins have been placed on the market yearly. But undoubtedly this process is destined to become of considerable importance, especially in localities where the drying of the first crop is accomplished with difficulty in the open air. The first and also most important condition in producing superior dipped raisins is that the grapes should be absolutely ripe. Unripe grapes will not produce any good raisins when dipped, but will turn reddish and otherwise become inferior.

Dipping Process.—A good location for dipping raisins is by the side of an irrigation ditch, provided the water in the latter can be depended upon to flow constantly while the operation of dipping lasts. If not, the water must be procured by pumping or by means of pipes from reservoirs or water-works. Flowing water is of great importance in producing good dipped raisins, and is required for the perfect washing of the grapes. For this purpose, if no ditch is available, a large trough may be used to advantage, and so arranged that the water in it can be kept changing through a continuous flow. The following is a cheap and efficient arrangement for dipping in actual use in one of the largest raisin vineyards, and can be recommended on account of its cheapness and easy working: On one side of the trough is a stationary iron kettle with a fireplace underneath. By the trough is also placed an upright post, about five feet high, and on this balanced a horizontal beam with a double motion. It can be raised and lowered at either end, or swung to the left or right with ease. On one end of the beam is a hook on which to hang the grape bucket. On the other side of the trough is a rough assorting table. Two or more buckets are needed. These buckets are common galvanized-iron buckets, perforated thickly with holes, the latter not large enough to let any loose grapes through. In the kettle is kept constantly boiling a solution of water and potash. Soda is not suitable. The very best potash should be used in the proportion of about one pound to twelve gallons of water. The ripe grapes are now brought to the table and emptied in the buckets. A bucket is then hung on the beam, the latter swung and the bucket for a second lowered first in the pure water and then in the boiling potash; but it is immediately withdrawn and immersed in the water-trough. When rinsed for a few seconds, the grapes are taken out and spread on common raisin trays. If the weather is warm, the trays are stacked one on top of the other, and the grapes thus prepared are dried in the shade.

The rinsing of the fruit before drying is of great importance, and by far not sufficiently understood. In Valencia the finest raisins are treated that way and thoroughly rinsed before being dipped in the lye. But nowhere in Spain are the grapes rinsed in water afterwards, and it is yet an undecided question if this rinsing improves or injures the raisins. It is certain that the washing cleanses the berries, as the water in the kettle is sometimes dark and dirty; but if it is an advantage to deprive the berries of the lye which more or less sticks to them is very doubtful. It is well known here that lye-dipped raisins are apt to mold if the rains set in while the drying lasts, while we are told that in Spain the dipped raisins do not spoil even if subjected to several showers of rain. From this it will seem as if rinsing after dipping is not necessary or perhaps even injurious, but that, on the contrary, rinsing before dipping is of the utmost importance. It may be possible that the lye which adheres to the grapes will, in a great measure, prevent them from molding.

In Spain no olive oil is used for mixing in the lye, and it is not likely that the oil process will come in vogue in California until it is fully demonstrated that it not only greatly improves the grapes, but that it also enables the grower to realize a correspondingly better price for his raisins. Those who care to experiment with it cannot do better than to follow the practice as it is used in Smyrna, for a full account of which we beg to refer to the article under that heading. We might here only point out that the oil-dipped raisins of Smyrna bring many times the price of the lye-dipped raisins of Valencia. The arrangement of dipping, kettles, etc., may, of course, be greatly varied. Steam may be used for heating the lye and the rinsing water, if it is desired to keep the latter hot, and regular trays might be used to hold the grapes, instead of the buckets referred to above. Every grower will no doubt vary these appliances to suit his own fancy, and improve upon the methods of others. As an example of the devices used by another grower, we here reproduce the following from an essay on bleaching raisin grapes, compiled by the chief viticultural officer, and especially referring to the system used by Mr. Byron Jackson: "Mr. Jackson places the grapes on a tray made with a frame of iron, which is covered with wire gauze with a quarter-inch mesh. The frame projects upwards on the sides to prevent the fruit floating off while in the dip, and is made to receive, as a cover, the wooden tray on which the fruit goes to the dryer. When dipped and rinsed, the wooden tray is placed over the dipping tray, and two men transfer the fruit by turning over the two."

The length of time required for dipping can only be ascertained by experience, and must differ with the strength of the lye, with the heat of the solution, and with the thickness of the skin of the grapes. Thus in different localities the strength of the lye and the length of immersion must always be different, and may even differ from year to year. When properly dipped, the skin of the grapes must show some very minute cracks, similar to cracks in glass which has been heated and suddenly immersed in or sprinkled with ice-cold water. Deep cracks are not desirable, as they will cause the juice of the pulp to leak out, after which the raisins will sugar. In Valencia the grapes used for dipping are the various varieties of Muscats, while in Smyrna both Muscats and Sultanas are used. Corinths are never dipped, as they dry readily and make superior raisins without this process.

Drying and Curing.—After the grapes are dipped, they must be immediately dried either in the sun, or in sun and shade alternately, or entirely in the shade. According to the circumstances attending the drying of the grapes, the color of the raisins becomes more or less red or yellow, transparent or opaque. The most perfect amber color is attained in the shade, while in the sun the color rapidly changes to reddish, a less desirable color in dipped raisins. The more favorable is the weather for drying, the choicer will be the raisins, and the better their color. If the sun is very warm and the chances are otherwise favorable for drying, the trays should be exposed to the sun only long enough to have their dip thoroughly evaporated, and for this purpose one day in the sun may suffice. After this the stacking of the trays is advisable, and only occasionally may the trays be spread if the drying does not proceed rapidly enough. Such shade-dried dipped raisins will assume a beautiful amber-yellow color, and bring several cents more than those exposed to very warm sun. If, however, the weather is not very warm, the grapes must be dried in the sun, and the grower has then to be satisfied with the color that nature will give to his raisins. Dipped raisins do not necessarily require turning, as they generally dry well anyhow in from four to six days in fair weather. For this class of raisins dryers are very useful to help finish the drying. Such dryers must be almost air-tight, as sandstorms would invariably spoil the raisins, which, on account of their stickiness, are almost impossible to afterwards cleanse. Dipped raisins should always be dried on their trays, and on special drying grounds, which should be so constructed that no sand can blow on them, or at least so arranged that in case of rain the sand from the ground will not be splashed over the trays. In California we have at present no such drying-floors, but it will pay any one who intends dipping his grapes to construct them either of bricks, bituminous rock or lumber.

Stemming, Grading and Packing.—Dipped raisins should be stemmed when well dried, and then graded in two grades. The proper receptacles for them are either sacks lined with paper, or twenty-pound boxes, in which they may be packed without fancy paper, or in the same way as prunes or other dried fruit. So far no uniform method of packing such raisins has been adopted in this State.

As to the usefulness and future of dipped raisins, not much can be said at present. Our importations of Valencia raisins, which are mostly dipped, are considerable, and as long as this class of cooking raisins is in demand, there is no good reason why we should not compete and endeavor to supply the demand. We can produce them as well as Spain can, and the only reason why we have not competed with Spain so far is that sun-dried raisins are so readily produced here, that it has not been to our advantage to produce anything else. There are, however, many places in our State which will grow Muscatel grapes of good quality, but with too thick skins to make them proper for sun-dried raisins. For all such localities the dipping process is to be recommended, as it will enable the growers to produce marketable raisins, and to profitably supply the demand for this variety of raisins now imported to this country from abroad. In localities with early and copious fall rains, the dipping process will enable the growers to finish quickly before the rains set in. California dipped second-crop Muscatels and Sultanas have brought as high as seven cents per pound wholesale.

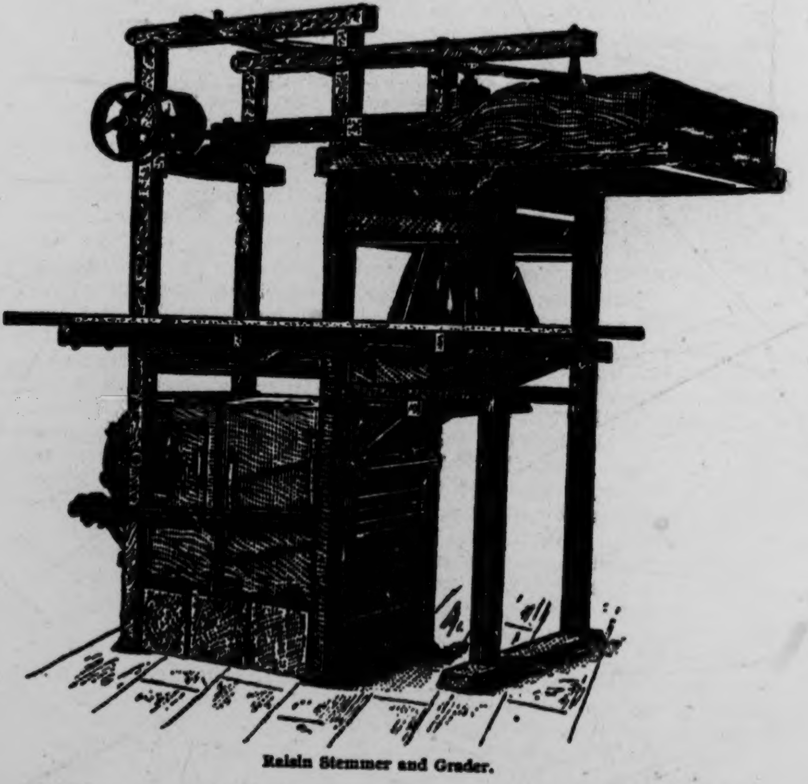
THE PACKING-HOUSE.

BUILDINGS AND MECHANICAL APPLIANCES.

The Packing-house.—The packing-house should be large and airy and, whether it is made of lumber, brick or adobe, it should in preference to anything else be large. Room is needed at every operation in the packing-house, and it is hardly possible to get too much of it. So far no very large and perfect buildings for packing-houses have ever been erected in California; the raisin industry is too young for that, and even the best of our buildings are only temporary ones. It is here not possible nor desirable to give any instructions how to build and arrange a raisin packing-house, as every packer will have his own ideas and his own necessities in this respect, and not two packers would build alike. All we can do here is to refer to what is needed in a general way, in order that the reader will get some preliminary ideas of what he will require when his raisin vineyard comes in bearing.

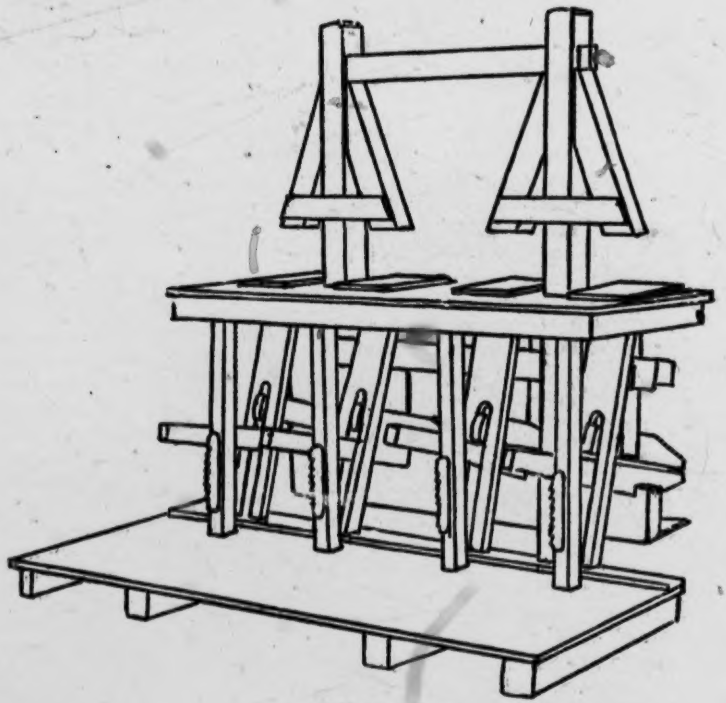
The packing-house should contain the following apartments: First, the general packing-room, in which the raisins are assorted and packed. Then the sweating-house or equalizing room, in which the boxes are stored for several weeks in order to equalize the moisture in the raisins. Then the stemming-room, in which the stemming and grading of the loose raisins is carried on. Then we have the weighing room, where the raisins are received from the field, and where they are weighed when this is required. There should also be an office and a pasting room, where the labels are pasted on the lining paper, and finally there should be plenty of veranda or shed room all around the building, where boxes of all kinds can be received and temporarily stored, either before the raisins are packed, or afterwards when they are ready to be shipped. We might also wish to have a room for a box factory, where boxes of all kinds are nailed up. This can in our climate best be done in the shed or under the veranda. The packing-house proper should be as large as all the other rooms together. It can hardly be made too large, as during the lively packing season hundreds of hands will here be busy, each one with his special work. The floor of the packing-house should be of matched lumber, and slanting towards the center, along which should run a small gutter. Any other material, such as cement, may also be used, the only object in view being that the floor can be washed from time to time and the dirt carried off through the gutter as readily as possible. The packing-room should have places for long narrow tables, at which the packing and assorting is done, and these tables can most conveniently be run the whole length of the room. At one end there should be room for the presses and the nailing tables, as well as storage room for empty and full boxes.

The Sweating-house.—The sweating-house or sweating-room should immediately adjoin the packing-room. It should be built either of matched lumber or of brick or adobe, in order that the temperature may be kept tolerably even and the moisture confined if necessary. The sweating-room in the Fresno Raisin and Fruit Packing Co's house in Fresno is large enough to contain 40 tons of raisins at one time, and is about 50 feet square, while the sweating-room on the Forsyth vineyard measures about 35 feet by 50 feet, and is built of brick in two stories, the lower one of which is used for raisins, the upper one for storage. For those who wish figures, we might state as examples of buildings, that the Forsyth packing-house, which also contains a sweating-room but not a stemming-room, is 120 feet by 35 feet, and contains besides a small platform outside for the reception of boxes, etc. The Fresno Raisin and Fruit Packing Co's building is about 150 feet by 75 feet.



Raisin Stemmer and Grader.

The Stemmer and Grader.—This large machine is a California invention. The principle on which it works is that the dry stems are separated by revolving the raisins rapidly in a drum made of perforated galvanized iron or of strong galvanized wire. After the stems are separated, the raisins fall together on screens of wire with various size meshes, through which the smaller berries are separated from the larger berries, while the refuse and broken stems are blown away by a fan. The most perfect stemmer and grader is the one on the Butler vineyard. The raisins are first dumped into a hopper below the floor, and from there they are run automatically on a belt to the top of the stemmer, where they enter the drum. From the drum they fall on the separating screens, which grade them in three grades, each one falling in a box of its own. Somewhat similar stemmers are seen in all the large vineyards, all run by steam and large enough to stem and grade from forty to sixty tons of raisins a day. There is considerable difference as to the ingenuity with which these stemmers are built, some requiring many more hands to run them than others. The Butler stemmer requires, part of the time, only one man for its successful running. The Forsyth stemmer stands under a shed in the open air, apart from the packing-house, in order that the dust may be freely carried away. The smaller vineyards have stemmers run by hand, and have separate graders also run by hand, large enough to stem and grade from five to eight tons of raisins per day.



Raisin Lever Press.

The Presses.—These are of two kinds, screw presses and lever presses. The screw press is much preferable (at least until the lever press may be perfected), as with it we can gauge the pressure given the raisins. The only press of this kind is found on the Raisina vineyard of T. C. White. The press that is generally adopted, and the one that is most handy, is the lever press, which is so constructed that four boxes of raisins can be kept in the press at one time, or until the last box or part of a box is ready. By a pressure with the foot, the levers are released and the boxes freed from the pressure. While this press is exceedingly handy and quickly worked, the pressure cannot readily be gauged, and the raisins are apt to be injured by too heavy pressure. But it is likely that improvements will soon be made which will remedy this defect.

Boxes and Cartoons.—The California raisin boxes are of three kinds,—whole boxes of twenty pounds, halves of ten pounds and quarters of five pounds. The wholes and the quarters are those most used, while the halves are seldom used or required. The cartoons are made of paper and contain two and one-half pounds of raisins each. The following are the measurements of raisin boxes and cartoons, and of the lumber required for making them. Twenty-pound box: 9 x 18 x 4¾ inches. Ten-pound box: 9 x 18 x 2⅜ inches. Five-pound box: 9 x 18 x $1\frac{3}{16}$ inches. The foregoing are inside measurements. The tops and bottoms are one-quarter inch thick, 19½ inches long and 9¾ inches wide. The sides of the twenty-pound box are 19½ inches long, 4¾ inches wide and three-eighths inches thick. The ends of a twenty-pound box are 9 inches long, 4¾ inches wide and three-fourths of an inch thick. The sides of the ten-pound box are 19½ inches long, three-eighths of an inch thick and 2⅜ inches wide. The ends of a ten-pound box are 9 inches long, three-fourths of an inch thick and 2⅜ inches wide. The sides of a five-pound box are 19½ inches long, three-eighths of an inch thick and $1\frac{3}{16}$ inches wide. The two and one-half pound cartoon is five inches wide, ten inches long and one and one-half inches deep.

Packing Frames or Packing Trays.—These are of two kinds, according to the method of packing. For the top-up method, wooden frames large enough to hold five pounds of raisins are used. In length and width these frames correspond with the raisin box, but in height they are only one-third of a whole box, or about one and one-half inches. The bottom is a sliding one, and can be pulled out broadwise. The frame is first lined on the inside with the necessary paper, and then five pounds of raisins are placed in the paper. A follower or block of wood, large enough to fill the form or frame, is then placed on top, the frame is placed over an empty box, the sliding bottom quickly withdrawn, and the whole contents fall in the box below undisturbed. For the top-down method, frames of galvanized iron are used, slightly deeper than the former, but the bottom is a drop-bottom, resting on a flange, instead of a sliding bottom, as in the former tray. A loose plate of zinc is placed on top of the frame, the latter is inverted and placed over the box, and the zinc plate quickly withdrawn, when the contents covered by the loose drop-bottom (or by the facing-plate) fall into the raisin box.

Facing-plate.—This useful tool was invented by T. C. White. It consists of a brass plate large enough to fit readily into the bottom of the raisin box. In this plate are arranged small cavities, each one wide enough to hold a large raisin. For large boxes the plate is made to contain eleven raisins the short way and eighteen the long way. The plate is first placed in the bottom of the iron frame in place of the loose bottom. A raisin is placed in each cavity and lightly pressed, and loose raisins are carefully filled in on the top. When this frame is afterwards reversed and the raisins and the plate as follower are received in the box, it will be found that the top layer has retained its arrangement and is regularly faced. This facing-plate enables the packer to face quickly and cheaply, but it can only be used when the top-down method of packing is used. The standard plate is nine inches by eighteen inches, and the plate for cartoons is five inches by ten inches, both made of heavy brass.

Scales.—For weighing the quantity of raisins necessary for every layer, scales must be found on every weighing table. Any ordinary grocery scales which work with springs may be used. Generally one pair of such scales are used at each end of the assorting table.

Labeling Press.—Of late every large packer labels his boxes before they are nailed together. This is done by passing the shooks through a labeling press, which prints under pressure the required label on each side or top, the name, etc., appearing in concave type on their face. These presses are run by machinery and work very rapidly.

Tables.—In the packing-house are tables of various kinds; they are generally long and narrow, and about four feet wide. The assorting tables should be furnished with square holes at intervals of five or six feet, so that the loose raisins may be scraped through them into boxes below. The assorting and weighing tables are furnished with a low flange or guard all around, to prevent any raisins falling on the floor.

Bags and Bag-holders.—Two kinds of bags are used,—cotton sacks or jute sacks. The former are white like flower sacks, the latter coarser and brownish. In the former no paper linings are used, but in the latter a paper bag is stitched, in order that the air may not penetrate and dry the raisins. Both kinds of bags are used to an equal extent. The cotton sacks contain either thirty or sixty pounds, while the jute sacks are made to contain an average of eighty pounds each. Patented bag-holders are used everywhere for holding the bags open while they are being filled.

Trucks.—For inside work, trucks very similar to those used in the vineyard are now generally adopted. They are handled with ease, and for moving boxes of various kinds are absolutely indispensable in the modern raisin packing-house.

Trays for Weighing.—These are small, shallow boxes, made of zinc or tin, and large enough to hold five pounds of raisins each. One short side of the tray should be slanting outward in order that the raisins may fall out readily. They are only used in weighing the raisins which are to go in each five-pound layer in the whole boxes.

Followers.—These are wooden blocks of the size of a quarter box of raisins, inside measurement. They should be lined with zinc on the flat sides, in order that they may be washed readily, and also to prevent the sugar of the raisins from adhering to them. They should be large enough to just fit inside a box or frame, and are used to keep the raisins steady while being changed from the frame to the box. They are also placed on top of the raisin frames when they are being pressed.

Paper.—Several kinds of paper are used in the raisin business. Heavy yellow manilla paper is used to place in the sweatboxes, one sheet between every two layers of raisins. The paper should be heavy, and cut to fit the box. Many growers use too short paper, which always has the inconvenience of causing the raisins to mix and become entangled. Only one whole sheet of paper should be used at a time; two short sheets will not answer, as, in lifting out a layer of raisins, the assorter takes hold of the four corners of the paper, and thus readily lifts out the raisin block. Lighter paper for lining the raisin boxes is used, both for layers and loose. The paper generally used is common book paper twenty-one by twenty-eight inches, and forty, fifty or sixty pounds to the ream in quality. Previous to being used, this paper is cut to fit the tray, a square piece being cut out of every corner. When placed in the tray, the central part of the paper fits the bottom of the tray, while the sides of the paper extend sufficiently over the sides of the tray to meet on top when folded over the raisins. Waxed tissue paper should always be placed on the top of the raisins in order to prevent the moisture from the raisins injuring the colored and artistic labels.

Colored lithographs or chromos of various designs and qualities are used for all raisins packed in boxes. When bought they come in three sizes. The central label should be nearly the size of the face of the box. The top labels are shorter pieces, almost as wide as the box, but only a few inches long. They are previously pasted to the top flaps of the lining. The side labels are twice as long as the face of the box, but not quite half as wide; they are similarly pasted on the long side flaps of the lining. There is a great variety of designs used, some of which are not appropriate. Whatever designs we use, it will be to the advantage of every country not to imitate, but to use labels characteristic of the country and locality where the raisins are made.

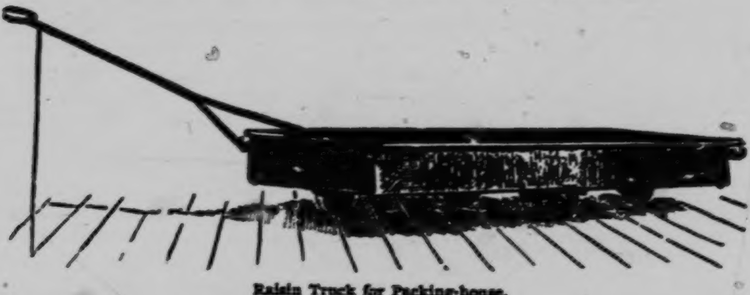
Tin Boxes.—For packing raisins for tropical countries, boxes made of tin should be used. The dampness in those countries causes raisins packed the common way to mold and spoil. No box should contain more than ten pounds of raisins, and the top should be so soldered on that it can be removed without cutting or injuring the box. The French system of soldering on by means of a narrow strip of tin, which can be wound up, is admirable, and could hardly be improved upon. Five ten-pound boxes should be packed in a *light* case made of light timber, and the whole package when closed should not weigh over sixty pounds. Four such cases will make one mule-load, and two such cases can be conveniently carried by one man.

LOOSE RAISINS.

Stemming and Assorting.—It must be understood that all the mechanical appliances and tools mentioned above should now be on hand ready for use and properly placed. The several different operations in packing, stemming, assorting, etc., of both loose and layers, will at times be carried on in different parts of the packing establishment at the same time, so as to meet the requirements of mixed lots or orders, the general shipments being of that nature. Loose and layer raisins are produced more or less from almost every sweatbox brought into the packing-house, and the only delay to their being immediately disposed of is because the layer raisins must be sweated or equalized before they are ready for use. The loose raisins, provided they are properly or sufficiently dried, are ready to be handled as soon as brought from the vineyard. A loose raisin, or a bunch from which loose raisins are to be made, must be overdried rather than underdried; at any rate, it must be so dry, that no juice will come out of it when the raisin is squeezed heavily or even torn. But a matter of greater importance even is that the stems should be brittle or sufficiently dry to break off readily. If they do not break, the raisins cannot be easily separated from the stem. The stems, instead of breaking off, will tear off, and the raisins will be open to the entrance of air, which will cause them to undergo a chemical change, to sugar and deteriorate.

As soon as a perfectly dried sweatbox of third-grade or loose raisins enters the packing-house, it should be taken to the stemmer. Any delay in this is injurious to the raisins, as they will rapidly undergo a sweating or equalizing, causing the stems to soften and to lose their brittleness. It will, therefore, be seen that loose raisins must on no account be sweated or equalized before they have been stemmed. Besides, if the raisins are in any way moist, they will not shed the dust and dirt when being passed through the stemmer. It is therefore to every raisin-grower's interest to so hasten the drying of the loose raisins that as many of them as possible can be out of the way when the layers, which take longer to dry, come in. This, as we have shown before, can only be done by assorting the raisins while green, and at the moment they are being picked from the vines. The different size bunches dry at different times, and the loose can then be partially disposed of when the layers are ready. The stemmer and grader should separate the raisins in at least three grades: Number one, large loose; number two, smaller loose; number three, smallest seedless, to which may be added a number four, or rubbish. The large loose bring always a good price, and great care should be taken with them. After having passed through the stemmer and assorter once, they should be passed through a second or third time, in order that all the inferior or smaller raisins may be eliminated. In this way, a fine, large number one is had, which is sure to give satisfaction. Number two loose may be passed through a second time if the stemmer has not done its full duty, and the same may also be done with number three seedless. It always pays to do a thing well, and this holds good with raisins as with everything else. Colonel Forsyth, who has acquired a high reputation for his loose raisins, advocates and practices this repeated assorting, especially of the number one grade, in order that it may be entirely uniform. Too many poor raisins are generally found among the small seedless, and if they are to be made to partially replace the seedless Sultanas or the Currants in the same manner as the number two is expected to replace the imported Valencias, they must be made clean from all rubbish. Only by producing a superior article can we hope to replace the imported dipped raisins by our loose Muscatels.

Packing and Cleaning.—The number one and two loose are always put up in whole boxes of twenty pounds each, never in quarter boxes, but sometimes in cartoons, to be used as samples or as holiday gifts. In packing whole boxes, they may either be faced or not. If not faced, the work is very simple. The raisins are first brought to a large separate table with a guard all around its edges, so as to prevent the raisins from falling to the floor. On each such table are one or more small scales. The workmen gather the raisins with small shovels, and place them in quantities of twenty pounds each in tin trays, with the guards slanting at one end, in order that the raisins may fall out readily. These trays are then immediately carried by other hands to the packing-table close by. Here the proper papers are being placed in regular whole raisin boxes, the loose raisins are poured in from the trays, and from time to time looked over and cleaned. All poor or inferior raisins should be carefully eliminated, and only good ones allowed to be boxed. Finally the paper leaves are folded over, and the boxes are taken away to be nailed up. Number two undergoes the very same process when packed in boxes.



Raisin Truck for Packing-house.

Sacking.—A very large trade is springing up in sacked raisins, and the demand for them is increasing every year. Both numbers two and three grades loose are now exported this way either in cotton sacks, or in jute sacks lined inside with paper. The jute sacks are by many preferred on account of their showing the dirt less, the cotton sacks generally arriving soiled at their destination. If cotton sacks are used for shipment East, they should be first placed in common burlap sacks, in order to arrive clean and attractive. The extra expense is not great, as the cheapest kind can be used for this purpose.

Facing, Top-up Method.—The facing is quickly done with the aid of White's facing-plate, but it can also be accomplished without it if the packer may so desire. The facing-plate, however, is greatly to be preferred, as we shall show directly. If no plate is used, the operation is as follows: At the filling table, fifteen pounds of loose raisins are weighed off directly in the twenty-pound boxes. Then five pounds loose are weighed separately in a tin tray. The whole boxes are taken to the packing-table and placed close to the press, one on top of the other, the smaller trays, with five pounds each, are brought to the facer, who now takes one of the loose wooden frames with a sliding bottom and places in it the necessary papers. He then fills in the five pounds of loose raisins, smooths and spreads them out, and sees that no bad berries are among the good ones. This operation may also be performed by different hands, so as to divide up the work. This is probably the best and most economical way. The next step is to take the tray to the press and subject it to a certain pressure, so as to get a smooth upper surface on which to face or place the raisins in rows. When this is done the tray is taken to the facer. The facer now has in front of him a tray filled with the ornamental papers and the five pounds of raisins. The surface of the raisins is smooth and even. The next operation is to place large raisins in rows on the top surface. A small box with loose, large raisins should be at the side of the facer, who in taking each one of them at first presses it towards the table with the thumb of either hand, thus flattening out the raisin in order to make it appear large. When the tray is faced, it may again be subjected to slight pressure, but generally this is not needed. The contents of the tray are now transferred to the twenty-pound box, which already contains fifteen pounds of loose. These loose raisins, which will be on the bottom of the box, are not generally wrapped in paper, although such would very much improve their appearance. The box is now ready for nailing. This top-up method is very inferior to the top-down method, as will be described further on. In packing with this method, only the wooden frame with the sliding bottom is used. The drop-bottom frame is only used for the top-down method.

Facing, Top-down Method.—In using this method, the top layer is finished first, and the bottom last. The packing is done as follows: In the bottom of a tin or galvanized-iron tray, previously described, is placed one of White's facing-plates. As will be remembered, the frame has a loose drop-bottom, which falls out as soon as the tray is turned over. The facing-plate is placed either directly on this loose bottom, or on the flange supporting it, and always with the facing-cups upward. The facer now places loose selected raisins, one in each hollow, presses his finger on the raisin and works it in the hollow until it becomes flattened. When all the cavities are filled, loose raisins are carefully filled in until the tray is full, when but a gentle pressure is required to steady the raisins and make them keep their places. In the meantime, fifteen pounds of raisins have been put in twenty-pound boxes and *gently* pressed. Some packers of choice raisins use a wrapper and label for every layer of five pounds, which greatly improves the general appearance of the box. After all is ready, a loose zinc plate is placed over the filled frame or tray, the latter is reversed and placed directly over the raisin box, in which has already been placed the required paper wrapper. The zinc plate, which only served to steady the raisins while the frame was being turned, is now quickly withdrawn, and the five-pound faced layer falls down in the box entirely undisturbed, kept so by the facing-plate which here acted as follower. The box is now ready for nailing, after a label and wax paper have first been placed on top of the plate. Without the facing-plate, a skilled facer can face some forty boxes a day, while from twenty to thirty boxes is a low average. With the facing-plate, the facing can be accomplished with more speed and accuracy.

Comparative Value of the Two Methods.—The top-up method has several disadvantages. It requires a heavy pressure of the raisins to create a smooth, flat surface on which to face. But even if no facing is done, the top layer will always be more or less uneven, and requires heavy pressure to make it smooth, and appear well and to advantage. This heavy pressure always bursts many of the raisins, and causes them to sugar and spoil. It has also another disadvantage, that the facing of the top layer can only be done with the fancy paper previously placed in the box. In facing and manipulating the raisins, this paper becomes more or less soiled and wet. In using the top-down method, the paper is placed in the box at the last moment, just before the final five-pound layer is emptied from the tray upon the fifteen-pound layer below. I consider these advantages so essential that I must strongly indorse the top-down method, and I believe that, in course of time, it will be generally adopted by all packers who care for the keeping qualities of their raisins. As to the time and expense required by these two methods, there is but very little difference. The top-down method is possibly a little slower and more expensive, but it is by far the better, and the difference in expense of packing is not great enough to be taken into consideration.

LAYER RAISINS.

Sweating or Equalizing.—This is a process by which the overdried raisins are made to attract sufficient moisture from the underdried raisins in the same box or bunch, and whereby the overdried raisins are made moister, while the underdried ones become drier. Equalizing also moistens the stems sufficiently to prevent them from breaking when being handled. In our California climate, where the air is so dry, this equalizing process is an absolute necessity, and no first-class raisin pack can be produced without the raisins having first been equalized. The word "equalizing" is to be preferred to "sweating," as the latter word may be misunderstood as meaning that a certain amount of heat is developed by storing the raisins. Heat is indeed necessary, but it should come from the outside air, not from the inside or from the raisins. If from the latter the raisins will be in a fair way to become spoiled. In the foregoing I have described the construction and workings of the sweathouse. It may be suggested that, if there is no sweathouse on the vineyard, a large sail or canvas may be used as a substitute. The latter is simply thrown over the boxes where they are piled out-of-doors, and answers to some degree in keeping the raisins moist. But as this is only a substitute, I shall not dwell longer on its usefulness. It may, however, be said in favor of this appliance, that it is used by one of our largest packers, and by him considered as of equal value if not superior even to a regularly constructed equalizing house.

The raisins which are to be sweated are only the clusters or layers, and not the loose, which as we have seen should at once be taken from the field to the stemmer, while the stems are yet crisp and dry. It is therefore of importance that the bunches or layers should be separated from the loose already in the field, or, which is much preferable, before they are dried, at the time when they are picked from the vines. If the latter is done properly, there will be only a small quantity of loose which will go in the sweating-house with the layers. The layers should at any rate be placed at once in sweatboxes when taken from the trays, and between every two layers of bunches there should be a stout sheet of manilla paper, in order that the bunches may not become mixed. When taken to the sweathouse the boxes should be so placed that air can enter every one. It will not do to place one box on top of another so as to cover up the top entirely, as the raisins are then apt to ferment in a very short time, and, before the raisin-packer is aware, whole piles may be absolutely spoiled. It is not necessary to place the boxes crosswise, as it is enough to allow the short side of each box to overlap the underlying box a little; sufficient air will then enter. In very dry weather the floor of the sweathouse may be sprinkled with water, but this is generally not needed, as the underdried raisins will give out moisture enough to soften those that are too dry, as well as the stems. Every day the sweathouse should be aired, and it is a mistake to believe that all air should be excluded. If air is not daily admitted, the raisins will mold and spoil, and it is even advisable to keep a circulation of air constantly through the house during the daytime. The attentive packer will soon learn to regulate this, and nothing but actual experience with his particular sweathouse will enable him to decide how much air should be let in and to what extent the doors should be closed.

At the end of from ten days to three weeks, the equalizing process should be over, and the layers ready for further packing. When the boxes are removed, it will be found that the majority of those raisins which had been too moist or underdried have dried sufficiently, while on the contrary the overdried raisins, as well as the formerly brittle stems, will have acquired sufficient moisture to enable the packer to manipulate them without risk of breaking the bunches. The raisins should be pliable, and stand moderate pressure without cracking or breaking. But while equalizing is an important operation, and one which we cannot dispense with, it is always to the grower's interest to so dry his raisins previously that they will require as little equalizing as possible, as even the most carefully sweated raisins which have once been overdried will never afterwards equal those which were at once properly dried in the field. The overdried raisins will always have a tougher skin and be inferior in color; but on the other hand they will keep better than raisins which have been dried less.

Grading and Weighing.—The next step after the raisins have been equalized is to remove them to the grading tables. This should not be done by dumping the contents of a sweatbox on the table, as in this way but very few of the real choice bunches are saved for the packer. If, however, the raisins have been placed carelessly in the boxes, without sufficient or perhaps without any manilla papers between the layers, the only way is to dump out the contents. By first placing the sweatbox on the long side, and then turning it over, the raisins are but slightly disturbed. But to get these out afterwards from the chunk is the great difficulty, and many bunches must necessarily be broken. If, again, the raisins have been carefully handled and consigned to the sweatboxes, with four papers in every box, not counting in the top cover, the care and handling of the sweatboxes will be much simplified. The sweatbox is then placed alongside of the grading table, and each layer with its paper is lifted out carefully, and placed on the table. The assorting is now to begin. The bunches are taken up one by one, all inferior berries are clipped out, all soft ones are separated and placed in a box by themselves to be further dried. As each bunch is examined and cleaned, it is put in one of the weighing trays resting on small scales at either end of the table, and, when the scales indicate that five pounds of raisins are in the tray, the latter is removed to the packing table.

In the meantime all loose or inferior bunches are raked down through the openings in the grading tables and received in sweatboxes below, to be either further dried or to be stemmed and graded at once. In packing several grades of layer raisins, the grading of the bunches should be made at this table. No great choice in selecting the bunches should be left to the packer, as his time should alone be occupied with the packing of his box. The best way is to have differently colored scales for number one and number two layers, and when taking them out of the sweatbox assort them at once by placing them in different trays. The graders can never be too careful. No moist raisins, no small ones, no red and poor raisins, should ever be allowed among a better quality. They will lower the grade of the whole box, while the good quality of high-grade raisins will not raise the grade of a generally poor box. Thus, while the many good raisins in a poor box are not paid for according to their value, the few poor raisins which will be accidentally or carelessly smuggled in a good box will lower the value of the whole. Few packers will sufficiently understand this, which is really the principle of all good packing, and which should be scrupulously adhered to. Even inferior size berries, if otherwise ever so good, should be carefully clipped from the large-berried bunches. It is astonishing how quickly the buyer will notice a few small berries, and how readily he will ignore the value of the largest raisins in the box.

Packing Layers, Top-up Method.—As with packing the loose raisins, there are two methods, the top up and the top down The top-up method can be as little recommended in this case as in the former, but as it is used by many of the packers I will here describe it: The trays containing the five-pound layers are placed in front of the

Riverside, Showing Orange Orchards and Raisin Vineyards.

packer on the packing table, so as to be within easy reach of the packer. The trays or frames with the sliding bottom are now used. The first move is to place one of the inner paper wrappers in the tray, and next the layers are placed in the frame as carefully as possible. There are two ways in vogue in which this is done. One of them is to crowd the raisins to one side,—"bunch" them, so to say, beginning at one end of the tray and gradually working towards the other end. This is the *wrong* way, which I am sorry to say is used by very many packers, who desire speed above everything, thus sacrificing care and quality and even appearance. Raisins packed this way point their ends upwards in a slanting way, which not only detracts from their appearance, but causes them to get entanged in each other. Such bunches when pressed will generally break, and, when lifted out of the box afterwards, will be very different from what they were when they were placed there in the first instance. The raisins, whatever method is used, should always be placed flat on the bottom of the tray. Care should be taken to arrange them so that they will fit, and only *very* few broken bunches should be allowed to fill unoccupied corners or spaces in the box. It is better even to leave such spaces empty than to tear up good bunches in order to get the small quantities needed, or in using inferior berries to fill up the holes.

When at last the tray is full, and all the five pounds of raisins from the weighing tray are in, the upper surface should be smooth so as to require as little pressure as possible. When full the trays are taken to the press and stored on a side table until actually used. The presses are generally arranged for four trays. These are now placed under the press, a follower is placed on the top of every tray, and only sufficient pressure applied. Frequently too much pressure is used, and the raisins are flattened out to their greatest possible extent, many even crushed and so broken that the juice runs out. All such crushed raisins will sugar in a few months, and the whole box containing them will spoil and deteriorate in value. If, again, the raisins have been properly pressed, they will keep for months or even years. After the trays have been sufficiently pressed, which generally is accomplished in one minute's time, the pressure is released, the follower removed, the folders turned over the raisins, and the trays removed to the boxing table, on which they may be allowed to accumulate until the boxer is ready to fill his boxes. On this table the final packing or "making up" of a box is done. It takes four of these five-pound frames to fill one whole box. Each tray is in its turn placed over a box, the sliding bottom is quickly removed, and the five-pound layer drops down in the box undisturbed. Every fourth frame should, in addition to the common paper wrapper, have labels and fancy paper pasted on the folders, or, as is sometimes done, an extra fancy folder or wrapper is placed on the third layer, and on the top or inside of it the fourth layer is dropped. Each layer will thus be found in its own wrapper, but the upper layer will have two, the outside one of which is fancy. Fine layers should have a waxed paper immediately above the raisins, in order that the moisture or sugar from them may not spoil the labels.

On the top of the waxed paper the chromo or label is placed. The box is now ready for nailing.

Packing Layers, Top-down Method.—This method I advocate as the most proper one to use. Thin galvanized-iron trays with a drop bottom are used. On the top of the drop bottom is placed a heavy follower of metal. White's facing-plate, turned over, can be used to great advantage, even where no facing is required. The choicest bunches are now selected and spread evenly on the bottom of the tray; other bunches are placed on top of them, and so on until the tray is full. Great care must be taken in packing so as to make the bunches fit each other and lie solid; otherwise they are very apt to be disturbed, or they will require too heavy pressure to be kept in place. When the tray is full, it is gently pressed, and the pressure kept up for a few seconds. A loose zinc plate is then placed over the tray, the latter is turned over and placed over the box, in which the necessary wrapping papers have been previously placed, the loose zinc plate is quickly withdrawn, and the contents fall into the box. The heavy follower keeps the top layer steady, and with a little care the raisins are not disturbed.

The top-down method for packing layers has the following advantages over the top-up method. It gives a smooth surface on which to pack the top layer, without necessitating pressure to first create such a surface, the packing being done on a hard plate. The wrappers are not soiled, as they are not first placed in the frames. The packer is enabled to pack and select his choicest bunches for the top layer while he has plenty to select from, and any odd berries and broken or smaller bunches come naturally in the bottom of each layer. In the top-up method all such odds remain for the top, where they *must* go in, in order to make up the required five pounds.

A raisin-packer averages seventy-five trays of five pounds each per day, for which she is paid two cents each. Some pack more than this; but very excellent packing proceeds slower, and a packer of very choice layers can only pack twenty-five trays of five pounds each per day, for which a correspondingly higher price is paid. In Malaga, a trained and expert packer receives between two and three dollars per day. In California, they do not receive any more. In our raisin district, the girls are rapidly becoming expert packers, and the same ones are reëngaged year after year by the same packing-house.

Filling.—The filling of the raisins is a trick to make them appear larger than they are. This filling was invented in Spain, and is used there especially on Dehesa boxes and where very expensive packing is required. It is done in the following manner. The raisin is first flattened out as much as possible, then the edges are bent, making the raisins slightly concave. In placing the concave side downwards, a smaller raisin is slipped underneath so as to cause the manipulated raisin to keep its shape. These filled raisins are used for facing only. The Spanish filled raisins have been handled to such an extent that all the bloom is lost, and the raisin looks anything but attractive. The California method of filling is a great improvement on the Spanish way. When the facing-plate is used, the raisin is first placed in a cavity on the plate, then worked out by a pressure with the finger, and when sufficiently concave another raisin is dropped in the hollow and pressed tightly. The faced raisin is thus filled, and when seen from the other side will appear much larger than otherwise. When, again, the top-up method of packing is used, a small block of wood may be employed. This block contains a single cavity of the size, that a raisin when pressed will fill it. The counterpart of this block is furnished with a convex protuberance, and when the two halves are placed together with a raisin between, and pressure is brought to bear, the raisin flattens out and becomes concave just enough to receive the filling.

In this way no handling with the fingers is done, and the raisin keeps its bloom undisturbed. Nothing is more attractive than a raisin with its bloom untouched; similarly the raisin that has lost its bloom always gives the buyer an idea that it has been fingered. Its appetizing quality is gone. Spanish Dehesas are generally both faced and filled. Some objection to this method is that it deceives, but as long as people not only are willing to be deceived but are actually anxious to pay for the deception, there is no reason why the filling should not be used. The deception, besides, is a very innocent one. It has also another excuse: A well faced and filled box is really a work of art; it will help to educate the people up to the appreciation of what fine raisins and fine packing should be. Filling and facing combined are practiced but little in California, and it is doubtful if filled facing will ever grow in much demand here.

Nailing and Trimming.—The boxes are next moved to the nailing table. Two nails are put in the short sides and two in the long sides of the cover. The boxes when nailed are passed to the trimmer, who with a drawknife trims the edges and cuts off the corners diagonally. The latter prevents the boxes or covers from splitting. The best nails are French wire nails for the sides and ends, one and one-quarter inches long, and for tops and bottoms one inch long.

Labels.—I cannot finish this part without adding some words about our labels. It is of importance that our labels and colored lithographs should be appropriate. The time has come when our raisins should stand upon their own merits, and should be designated with appropriate names. I should wish to see only California names used, California layers instead of London layers, California scenes instead of foreign scenes, which give no idea of our conditions, and which do not help to advertise our State and its resources. Whatever our labels may represent, they should be distinctly Californian. Another point which is but seldom observed on these labels is the shape and color of our raisin grapes. The latter are often represented on the labels, but their shape is seldom observed. Nowhere have we seen on them a true Gordo Blanco or a true Muscat of Alexandria represented, the grapes there pictured being impossible as raisin grapes, or even well-known wine or table grapes, out of which no raisins could be made. The packer has a right to protest against such misrepresentations of our fair grapes, especially as the lithographer could just as readily and just as cheaply have followed the originals. A beautiful label is well worth its price. As a work of art, it is seldom thrown away, but is carefully kept and made to adorn the walls of many a humble home, in which the name and fame of our State will soon be a household word. Let these labels go out by the million yearly to tell of our climate and of our soil, and of the land where the luscious raisins are produced, with the same care as apples or garden stuff in countries less favored by nature.

STATISTICS OF IMPORTATION, PRODUCTION AND PRICES.

Production of Raisins in California from 1873 to 1889:

	Twenty-pound boxes.		Twenty-pound boxes.
1873	6,000	1882	115,000
1874	9,000	1883	140,000
1875	11,000	1884	175,000
1876	19,000	1885	500,000
1877	32,000	1886	700,000
1878	48,000	1887	800,000
1879	65,000	1888	963,000
1880	75,000	1889	1,000,000
1881	90,000		

The California crop, from 1885 to 1889, was divided between the various raisin districts of the State about as follows:

	1885.	1886.	1887.	1888.	1889.
Fresno	107,000	225,000	350,000	440,000	475,000
Riverside and San Bernardino	129,000	195,000	190,000	270,000	265,000
Orange County and Los Angeles County	139,000	180,000	85,000	42,000	8,000
Woodland and Davisville	67,000	75,000	125,000	115,000	120,000
San Diego	10,000	25,000	20,000	40,000	75,000
Tulare	6,000	8,000	10,000	11,000	15,000
Kern	–	–	–	–	4,000
Scattering	12,000	15,000	20,000	25,000	25,000
	470,000	723,000	800,000	943,000	987,000

Number of Acres in Raisin Grapes in California in 1890:

Fresno district	30,000	acres.
Balance of San Joaquin valley	10,000	"
San Bernardino district	5,000	"
San Diego and El Cajon	6,000	"
Yolo and Solano	8,000	"
Balance of the State	7,000	"
	66,000	"

This includes grapes in bearing, as well as vines lately set out.

California and Malaga Prices, Importations, etc., from 1871 to 1889:

The following statistics of prices of California and Malaga raisins have been mostly compiled from various sources, such as the Fresno *Expositor*, the San Francisco *Journal of Commerce*, the *Fruit Grower*, etc. These statistics and notes will give a fair idea of the progress made by the raisin industry in this State since 1873, the year when our raisins first cut any conspicuous figure in the market of this continent. The first struggle of the raisin-producers of this Coast was directed against the importers of Malaga raisins, and against the prejudice of our own consumers. It took about ten years to supersede the Malaga product by our own. The following table gives the importation of Malaga raisins to this State from 1871 to 1884:

	Twenty-pound boxes.		Twenty-pound boxes.
1871	16,534	1881	1,719
1872	36,153	1882	1,218
1873	27,692	1883	633
1874	35,447	1884	1,437
1875	22,228	1885	800
1876	29,187	1886	—
1877	13,357	1887	—
1878	14,824	1888	—
1879	10,884	1889	—
1880	3,988		

It will be observed that the imports began to fall off in 1875, being that year more than 13,000 boxes short of the preceding year. In 1876 the importations struggled back to 29,187, still being more than 6,000 boxes short of the importations of 1874; and then the battle was practically won, for in the succeeding years the importations dwindled away until in 1883 only 633 boxes were imported. The figures from 1886 to date are not obtainable, but are so insignificant as to be considered unnecessary to record.

1873.— In 1873 the market was liberally supplied with Malaga raisins, which brought at wholesale the following prices: Layers, whole boxes, $3.00 to $3.75; half boxes, $3.62½; quarters, $3.75; eighths, $4.00 to $4.25; London layers, $4.50.

1874.— Coming down to 1874, the Malaga still holds the fort, layers bringing $3.25 for whole boxes, and $3.12½ for half boxes, with the customary advance on fractions. In all this time the California raisin was too insignificant for notice, and was not quoted by commercial papers.

1875.— On January 14, 1875, this significant comment appears in the *Journal of Commerce*: "A decided change is being wrought in the markets of this coast respecting the use of Malaga raisins, figs, Zante currants, Hungarian prunes, almonds, walnuts, etc. In fact, from this time forward Pacific Coast supplies of bunch raisins and dried fruits generally are to be produced here in large quantities, and in favorable seasons we will doubtless have a large surplus of almonds (hard, soft and paper shells), English walnuts, chestnuts, hickory nuts, raisins, figs. etc."

On November 4, 1875, it was recorded that up to the 1st of November there had been received 6,000 boxes of California raisins, "the quality generally good," worth from eight to ten cents per pound, say $2.00 and $2.25 per box of twenty-two pounds net; London layers, $3.50 and $3.75.

1876.— In January of 1876 Malagas were quoted at $3.25 and $3.50, California raisins bringing ten and twelve and one-half cents per pound. The following comment was made at that time, which may be considered as another mile-stone in the progress of the California industry: "Malaga raisins have been imported to very much less extent the present than last season, owing to the large products of California cured, which latter have amounted to upwards of 30,000 boxes, about one-half of which have been of prime quality, suitable for table use, a portion being poorly cured and considerably inferior to the imported, but have sold at lower rates for ordinary cooking purposes."

The California raisin was now fairly on its feet, so to speak, and was in lively competition with the Malaga dried grape. The market reports spoke well of Blowers' California Muscatels and Briggs' bunch raisins. The jobbers, however, were loth to give up the Malaga; but to sell that article they had to import an extra choice quality, as the public was beginning to show a marked preference for the home product. In proof of this the following extract, dated November 9, 1876, is given: "The quality of the Malaga raisins now here is superior to any ever before imported, and have a preference over our best California raisins. This, however, will not always be the case, as experience makes perfect, and in a few years we will be entirely independent of the Old World for all sorts of dried fruits."

1877.—In November, 1877, very complimentary notice is made of Blowers' layer raisins from Woodland, which brought $2.75 and $3.00 per box. Briggs' raisins were worth $2.25 and $2.70. This extract, dated January 18, 1877, is still another landmark in the raisin industry: "The consumption of raisins has been fully up to the average of past years, yet divided between Malaga imports and our own California production. Of the latter, upwards of 20,000 boxes have been already marketed; and, had it not been for the unusual and unexpected heavy rainfall in October, there is every reason to believe that our home crop of bunch and layer raisins would have reached 50,000 boxes of twenty pounds each. Blowers' Muscat raisins were superior and in every way equal to the imported. Briggs, of Marysville, also turned out several thousand boxes of bunch, and others have made a creditable beginning. Enough has been done here in this line to satisfy our grape-growers that raisin-curing is to be, in the near future, a prominent California interest, and, to do it successfully, the sun-drying process is infinitely superior to that of machine-drying. Sheds must be erected and prepared in time to protect the fruit from early rain, and then the working process is sure to all who have the right kind of grapes. Then uniform weight in twenty, ten and five pound boxes, all handsomely put up in fancy papered boxes, and California then will be prepared to secure all the raisin trade west of the Rocky Mountains, and a good part of that of the Eastern States. As it is, those of our merchants importing Malaga raisins from New York confine themselves to London layers and others of the best and choicest quality, leaving the home market to be cared for, in a great measure, by those of our own production. As a result, raisins have ruled low all the winter, and are likely to do so for a long time to come."

1878.— In 1878 several carloads of California raisins were sent to Chicago, New York and Boston, and were well received by the trade. In October of that year, California layers were bringing $2.50 and $3.25. Imports had fallen away more than forty per cent from the figures of 1874.

1879.— In 1879 the ruling prices for California raisins, in lots of 250 boxes and upwards, were: Common layers, $2.00 for wholes, $2.25 for halves, $2.50 for quarters, $3.00 for eighths; London layers, $2.25 to $2.50 for wholes, $2.50 to $2.75 for halves, $2.75 to $3.00 for quarters, $3.25 to $3.50 for eighths.

1880.— In October, 1880, the following quotations were made: Briggs' layers, $2.00 and $2.75 per box. California raisins, in lots of 250 boxes and upwards, common layers, $2.50 and $2.25 per box; London layers, $2.50 per box.

1881.— In November of 1881, Malaga ruled high in the East, and in consequence prices were generally higher here, quotations for the California article running $2.50 for wholes, $2.75 for halves, $3.00 for quarters, and $3.25 for eighths, in lots of one hundred boxes. London layers, twenty-five cents per box more.

1882.—In 1882 prices ran $2.37½ and $2.75. During all the period just reviewed, the duty was two and a half cents per pound on raisins; but in March, 1883, the duty was reduced to two cents, and yet importations for that year were only 633 boxes,—a rather singular fact. The reduction in duty does not seem to have had a very bad effect on prices, because, as is easily evident from the small importation, no competition to speak of was encountered in the local market, and, as in that year the imports at New York from Spain were many thousands of boxes short, Eastern competition was reduced to a minimum. Prices here ruled through the year at an average of from seven to eight cents a pound, anything especially choice bringing better prices.

1883.— In 1883 California made a big stride forward in packing and curing, and fancy raisins were put up in layers and cartoons. The Dehesa brand and other fancy brands made their appearance, and as high as one dollar was paid for quarters of five pounds each, and T. C. White's and Miss Austin's brands became famous.

1884.— In 1884, the year following that in which the duty was reduced to two cents, the following prices prevailed:

In January the following quotations are recorded: Malaga layers, $3.50 for wholes, $5.00 for halves, and $5.50 for quarters in frames. Valencia raisins, fifteen cents per pound. Loose Muscatels, $1.60. London layers, $4.00. Briggs, wholes $2.50,—usual advance of twenty-five cents on fractions. Blowers, wholes $——, quarters $3.50, eighths $3.75. Other raisins, $2.50 in large lots; quarter and eighth boxes twenty-five cents higher.

In August the following were the quotations: Malaga layers, $3.50 for wholes, $4.00 for halves, and $4.50 for quarters in frames. Valencias, fifteen cents per pound. Loose Muscatels, $1.90. London layers, $3.00. Briggs, wholes $1.40, halves $1.75, quarters $2.25, eighths $2.75. Blowers, wholes $2.25, halves $2.50, quarters $2.75, eighths $3.00.

In October the following quotations are to be found: Common layers, $1.00 to $1.25 for wholes, $1.50 for halves, $1.75 for quarters, $2.25 for eighths. London layers, $1.35 to $1.50 for wholes, $1.95 for halves, $2.00 for quarters, $2.50 for eighths.

In November, 1884, the following comment is made: The California raisin pack will probably be 100,000 boxes. There would have been much more but for the October rains, that prevented proper curing. The crop in Europe is short, too, and prices are much higher than they were a year ago. It is said that 15,000 boxes have been sold for the East. We quote: Malaga layers, $3.75 for wholes, $4.00 for halves, and $4.50 for quarters in frames. Valencia raisins, fifteen cents per pound. Loose Muscatels, $1.90. London layers, $4.00. Briggs, wholes $1.75, halves $2.00, quarters $2.35 to $2.50. Blowers, wholes $2.00, halves $2.25, quarters $2.50, eighths $2.75. California layers, wholes $1.50, halves $1.75, quarters $2.00.

1885.— In 1885 the market showed a gratifying ability to absorb at profitable rates a good article, for prices ran: California common layers, $1.75 for wholes, $2.00 for halves, $2.25 for quarters. Briggs, wholes $2.00, with an advance of twenty-five cents on fractions. Blowers, $2.25 for wholes, with an advance of twenty-five cents on fractions.

1886.— In 1886 quotations show that only extra choice Malagas were imported, and that, too, for a limited trade. Prices were: Malaga layers, $4.00 for wholes, $4.25 and $4.75 for halves and quarters. Valencia raisins, fifteen cents per pound. London layers, $3.00. California layers, wholes $1.75, —usual advance of twenty-five cents on fractions. Briggs, wholes $2.00, halves $2.25, etc. Blowers, wholes $2.25,—usual advance on fractions.

For 1886 the market is reviewed as follows: The past year has been the greatest for California dried fruit that the State has ever seen. There has been an increase in every item, and a specially heavy increase in the matter of raisins, the production of which has increased so fast that they have become a leading article of merchandise. Where we were large importers and generous consumers, more in proportion to our size than any one else in the world, we have almost totally ceased importation and are among the largest producers and exporters in the world, next to Spain itself. The total receipts of imported raisins at New York for the season of 1886–87 were as follows: 911,816 boxes of Valencias, 427,936 boxes of Malagas, 400 half boxes of Malagas, 88,657 boxes of Sultanas. The California pack is this year almost doubled, and shows great improvement in quality and packing.

1887.— In October, 1887, prices were quoted as follows: London layers, per box, $2.00 to $2.25. Loose Muscatels, from $1.50 to $1.80.

Riverside, El Cajon and Fresno raisins of excellent quality are now in the market, and Butler and Forsyth raisins in Fresno begin to rival the very best imported brands. Many large packing-houses are established in Fresno, Riverside and El Cajon.

1888.—The pack reaches in California 850,000 boxes, and the Fresno as well as the Riverside raisins are very large and choice. Forsyth and Butler raisins take the lead, some of the choicest layers bringing as high as one dollar per five-pound quarter box. Only 112,000 boxes of Malaga raisins are imported to the United States.

In October, 1888, the following prices were obtained for imported raisins at auction sale in New York: 645 boxes best London Layers, $3.25 to $3.12½; 348 Imperial Cabinets, $3.35 to $3.20; 200 fine Dehesa Bunches, $4.50 to $3.75; 50 Imperial Dehesa Bunches, $5.65; 104 Dehesa Bunches, $4.05 to $4.00; 100 Finest Selected Clusters, $4.45 to $4.40; 50 Finest Royal Clusters, $4.75; 3 Imperial Excelsior Dehesa Loose Muscatels, $5.00; 140 Imperial Loose Muscatels, $3.30 to $2.15; 1 Imperial Excelsior Dehesa Clusters, $5.50; 9 Imperial Dehesa Clusters, $5.12½ to $5.00; 2 Dehesa Dessert Fruit, $4.10; 1,194 Finest Valencia Layers, 8⅛ to 8 cents; 899 Finest Valencia Raisins, 7 to 6¾ cents; 150 half boxes Finest Valencia Layers, 8⅛ to 8 cents; 246 boxes Finest Sultanas, 8¼ to 8 cents.

At the same time California layers were quoted at from $1.80 to $2.25 for medium grades, while for Dehesa and Imperial quarter boxes from eighty cents to one dollar were realized. Raisins in sweatboxes were bought by packers at five cents per pound, prices not rated according to quality.

1889.—The crop of 1889 was not as large as at first calculated, on account of loss through unusual and heavy rains. It was especially the second crop which suffered. The first crop was good, and brought good prices, average layers bringing from $1.75 to $2.25 per box of twenty pounds. Great improvement is made in packing and labels, and our average raisins are better than the average imported Malagas. Our choicest layers, however, do not yet equal in size, curing and packing the choicest Malagas, and no efforts have been made to compete with them. There are at least four higher grades packed in Malaga which we do not produce here. During last season raisins in sweatboxes have ruled higher than before, and have been bought by packers at from three to seven cents.

1890 (to July).—The crop promises to be as large as last year. It is greatly in demand, and representatives of Eastern and California dealers have already bought up the most of the coming crop at prices averaging one-half a cent more per pound than last year.

From the above statistics we learn that through the production of raisins in California the price of sun-dried raisins to the consumer on this coast has been lowered from $3.00, $3.75, $4.00 and $4.50 in 1873 to $2.00 and $2.50 in 1890. The importation of Malaga raisins in the United States has greatly diminished, while that of Valencia or "dipped" raisins has increased. In 1873, the United States imported 35,271,312 pounds of raisins, for which it paid $2,292,948, while in 1888 our importation was 40,340,117 pounds, or about five million pounds more, for which we paid $2,098,503, or about $200,000 less.

Exports of Valencia Raisins from 1850 to 1889, according to English estimates:

YEAR.	England.	America.	Other Places.	Total Tons.
1850	9,423	165	....	9,588
1851	8,491	285	787	9,563
1852	8,844	320	....	9,164
1853	7,883	99	70	8,052
1854	7,206	296	50	7,552
1855	7,464	736	85	8,285
1856	8,909	......	12	8,921
1857	9,485	......	....	7,900
1858	13,542	654	182	14,378
1859	9,546	163	113	9,822
1860	7,257	2,831	454	10,542
1861	8,072	63	143	8,278
1862	7,564	......	238	7,900
1863	12,290	125	100	12,515
1864	8,655	38	182	8,875
1865	9,863	362	12	10,237
1866	12,735	403	473	13,611
1867	12,701	668	177	13,546
1868	14,293	3,095	794	18,182
1869	8,434	1,857	25	10,316
1870	10,060	2,210	110	12,380
1871	12,578	5,210	625	18,413
1872	15,677	4,088	535	20,300
1873	10,796	2,960	710	14,466
1874	13,724	5,513	439	19,676
1875	12,568	6,590	595	19,753
1876	15,272	3,816	676	19,764
1877	......	......	....	......
1878	......	......	....	......
1879	15,231	9,525	1,244	26,100
1880	13,026	8,977	892	22,895
1881	17,507	10,169	969	28,625
1882	18,121	21,593	1,732	41,346
1883	19,644	16,722	3,983	40,349
1884	10,210	9,686	4,289	24,185
1885	10,250	9,397	3,596	23,243
1886	15,194	15,687	16,113	36,994
1887	16,648	18,831	3,479	38,958
1888	15,524	12,245	4,655	32,424
1889	12,000	14,645	1,724	27,369

Exports of Malaga Raisins from 1864 to 1889:

YEAR.	U. S.	British Colon's	Great Britain.	France.	North Europe.	South Am.	Sundries	Total Boxes.	Total Tons.
1864	879,794	45,906	258,458	137,379	59,659	109,741	209,000	1,200,000	13.200
1865	879,794	75,708	269,072	171,743	64,319	96,658	255,000	1,800,000	19,800
1866	907,305	72,208	220,756	178,862	62,076	115,305	191,000	1,750,000	19,250
1867	966,724	96,124	166,737	129,391	58,222	116,762	135,000	1,670,000	18,370
1868	1,053,726	125,407	222,426	163,306	64,262	103,082	215,000	1,950,000	22,450
1869	767,321	58,265	175,602	117,612	82,472	67,634	80,800	1,350,000	14,850
1870	1,331,937	120,039	216,015	90,193	57,687	113,755	270,000	2,200,000	24,200
1871	1,147,633	98,817	183,916	161,123	69,800	87,242	274,000	2,200,000	24,200
1872	1,325,705	95,024	383,890	230,046	72,788	119,042	-	1,920,000	21,120
1873	1,368,822	45,495	241,325	196,239	99,424	-	140,000	2,500,000	27,500
1874	1,320,000	43,490	240,000	200,000	99,500	-	-	2,160,000	23,760
1875	976,000	42,000	271,000	203,000	98 000	-	98,000	1,670,000	18,370
1876	1,321,000	52,000	357,000	276,000	115,000	-	91,000	2,252,000	24.772
1877	1,250,000	56,600	250,000	300,000	100,000	-	-	2,200,000	24,200
1878	1,182,088	58,242	194,471	330,767	99,661	98,429	211,000	2,180,000	23,980
1879	1,146,228	30,598	237,659	368,420	107,888	63,688	170,000	2,125,000	23.372
1880	1,115,101	46,717	174,126	297,412	108,222	75,456	197,000	2,015,000	22,165
1881	1,043,727	31,730	141,415	251,382	101,828	81,196	147,000	1,800,000	19,800
1882	967,571	38,431	176,349	277,253	130,646	98,007	178,000	1,200,000	13,200
1883	-	-	-	-	-	-	-	-	-
1884	-	-	-	-	-	-	-	-	-
1885	-	-	-	-	-	-	-	-	-
1886	-	-	-	-	-	-	-	-	-
1887	-	-	-	-	-	-	-	850,000	9,350
1888	-	-	-	-	-	-	-	850,000	8,250
1889	120,000	-	-	-	-	-	-	750,000	-

First Cost of Crop of Valencia Raisins, according to the "California Fruit Grower:"

1884, from	$4.00	to	$6.00	per	hundred	pounds.
1885, "	5.00	to	6.00	"	"	"
1886, "	3.00	to	5.00	"	"	"
1887, ...	4.00	....		"	"	"
1888, from	2.00	to	4.00	"	"	"
1889, ...	3.50	....		"	"	"

Production and Distribution of Smyrna Raisins from 1844 to 1884, according to U. S. Consular Reports:

1844	8,000 tons.
1868	19,000 "
1871	48,000 "
1872	31,000 "
1879	75,000 tons.
1881	49,000 "
1884	95,000 "

According to English estimates, the raisin crop of Smyrna only reached 27,000 tons in 1876, and was divided as follows:

Red Raisins.—Chesme	5,100	tons.	
Vourla	5,000	"	
Yerly	2,800	"	
Carabourna	1,600	"	
			14,500 tons.

Sultanas.—	Chesme	7,400 tons.	
	Vourla	3,100 "	
	Yerly	1,150 "	
	Carabourna	800 "	
			12,450 tons.
			26,950 tons.

This crop was distributed as follows:

Red Raisins.—	England	2,699 tons.	
	North of Europe	6,488 "	
	Trieste	2,260 "	
	Russia and Turkey	2,995 "	
			14,442 tons.
Sultanas.—	England	7,945 tons.	
	North of Europe	1,525 "	
	Trieste	2,820 "	
	Russia, etc.	285 "	
			12,575 tons.
			27,017 tons.

The World's Raisin Production in 1889:

Greece	125,000 tons.
Smyrna	120,000 "
Valencia	28,000 "
Lipari, Calabria and Pantellaria	15,000 "
California	10,000 "
Malaga	8,000 "
Scattered	5,000 "
Chile	1,000 "
	312,000 tons.

The above does not include dried wine grapes from Italy, California and Algiers, nor any raisins made in Australia (Victoria).

Statement Showing the Quantity and Value of Currants, Figs and Raisins Imported and Entered for Consumption in the United States from 1873 to 1878:

YEAR ENDING JUNE 30.	RAISINS.		CURRANTS, ZANTE AND ALL OTHER.		FIGS.	
	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.
	Pounds.	Dollars.	Pounds.	Dollars.	Pounds.	Dollars.
1873	35,271,312	2,292,948 83	14,141,797	566,386 49	7,995,035	506,205 45
1874	36,419,922	2,544,605 95	19,319,191	752,694 00	5,630,292	391,300 16
1875	30,501,316	2,443,155 50	19,334,458	771,384 56	4,659,860	357,823 99
1876	32,221,065	2,425,277 14	20,911,061	856,425 62	5,056,779	361,835 53
1877	32,419,637	2,109,333 60	17,152,664	749,488 00	5,889,011	398,982 22
1878	32,931,736	1,904,866 13	17,941,352	776,827 00	3,873,884	262,428 15

Statement Showing the Quantity and Value of Currants, Figs and Raisins Imported and Entered for Consumption in the United States, with Rates of Duty, etc., from 1879 to 1888:

RAISINS.

YEAR ENDING JUNE 30.	QUANTITY.	VALUE.	Rate of Duty.	AMOUNT OF DUTY COLLECTED.	Additional and Discriminating Duty.
	Pounds.	Dollars.	Per lb.	Dollars.	Dollars.
1879	38,523,535	1,943,941 14	2½c.	963,088 42	92 51
1880	39,542,925	2,274,763 00	2½c.	988,573 19	48 43
1881	39,654,755	2,711,771 74	2½c.	991,368 94	80 50
1882	43,779,867	3,260,033 74	2½c.	1,094,496 71	–
1883	51,487,389	3,495,599 45	2½c.	1,287,184 77	20 70
1884	56,676,658	3,543,916 15	2 cts.	1,133,533 15	52 70
1885	39,778,695	2,728,847 46	2 cts.	795,573 90	247 35
1886	37,999,306	2,782,599 76	2 cts.	759,986 12	50 00
1887	40,660,603	2,297,469 30	2 cts.	813,212 06	34 00
1888	40,340,117	2,098,503 00	2 cts.	806,802 34	80 10

CURRANTS, ZANTE OR OTHER.

YEAR ENDING JUNE 30.	QUANTITY.	VALUE.	Rate of Duty.	AMOUNT OF DUTY COLLECTED.	Additional and Discriminating Duty.
	Pounds.	Dollars.	Per lb.	Dollars.	Dollars.
1879	17,405,347	520,831 07	1 ct.	174,053 47	–
1880	18,007,492	600,603 40	1 ct.	180,074 92	–
1881	21,631,512	845,773 00	1 ct.	216,315 12	–
1882	32,592,231	1,388,886 00	1 ct.	325,922 31	–
1883	31,171,171	1,247,504 00	1 ct.	311,711 71	–
1884	32,743,712	1,220,575 16	1 ct.	327,437 12	–
1885	25,534,507	723,415 00	1 ct.	255,345 07	–
1886	22,623,171	744,784 00	1 ct.	226,231 71	117 80
1887	29,196,393	1,062,326 00	1 ct.	291,963 93	–
1888	30,636,424	1,176,532 76	1 ct.	306,364 24	–

FIGS.

YEAR ENDING JUNE 30.	QUANTITY.	VALUE.	Rate of Duty.	AMOUNT OF DUTY COLLECTED.	Additional and Discriminating Duty.
	Pounds.	Dollars.	Per lb.	Dollars.	Dollars.
1879	3,369,475	247,075 06	2½c.	84,236 89	–
1880	6,266,413	440,507 00	2½c.	156,600 34	–
1881	3,420,427	379,382 55	2½c.	85,510 72	–
1882	8,874,186	678,341 87	2½c.	221,854 70	–
1883	5,345,324	489,108 38	2½c.	133,633 09	–
1884	7,840,634	504,532 02	2 cts.	156,812 68	–
1885	7,774,492	516,083 63	2 cts.	155,489 84	6 50
1886	6,988,642	499,985 80	2 cts.	139,772 84	–
1887	8,752,898	488,632 00	2 cts.	175,057 96	137 00
1888	9,965,584	495,541 50	2 cts.	199,311 68	–

Statement of Consumption of Currants and Raisins per Head of Total Population in 1884:

United Kingdom of Great Britain.	4.38 pounds.
United States of North America..	1.70 "

Prices Ruling in the California Raisin Districts:

It is not my intention to give here a regular prospective estimate of the cost of a raisin vineyard and the profits to be derived therefrom. Such an estimate, applicable to every case, cannot be made out; about it not two raisin-growers with equal experience would agree. Below I simply give isolated statistics of costs of the various operations necessary in the raisin industry. Each one can figure for himself, and my advice is to add liberally to the calculated expenses, if disappointment would be avoided.

As to the profits of a raisin vineyard, the reader will by this time understand how it might vary, how it must depend upon nice little circumstances, never foreseen and only to be taken advantage of or counteracted by the experienced grower. The high statements which have been given in these pages as samples of how much might be gained from an acre of raisin-vines can never be counted on as regular. From fifty to several hundred dollars per acre may be obtained as net profit by care, skill and favorable circumstances, but an average of seventy-five dollars per acre can be considered a conservative sum, which the owner of a good irrigated vineyard may calculate on as a safe net profit. Many do not reach even that. But, even with that profit per acre, how many horticultural industries can be counted on to produce better results? Very few, if any. For the benefit of those who desire figures to guide them, the following statistics are offered. They have been carefully compiled in company with T. C. White, one of the most prominent raisin-growers the State has ever had. These statistics refer especially to the Fresno district, but they will be found to differ but little from those elsewhere in this State.

Land suitable to raisins can be had at from fifty to two hundred dollars per acre. No one not thoroughly acquainted with the requirements of raisin land should attempt to rely on his own judgment alone in making a selection.

Vines, already rooted, at from ten to twenty dollars per thousand vines. An average would be fifteen dollars. The cost of *rooting* vines is from one dollar to two dollars and fifty cents per thousand, according to locality and circumstances.

Cuttings, from two to three dollars per thousand, more or less, acording to size and quality.

Planting rooted vines, one cent per vine. Planting cuttings, half a cent per cutting.

Plowing yearly, one dollar and fifty cents per acre.

Harrowing, fifty cents per acre.

Leveling land for irrigation, according to the quality of the land. Leveling the land in from one-half to three-quarter acre checks, including small ditches, etc., can be done for from ten to fifteen dollars per acre, if the land is fair. Rougher land will cost twenty-five dollars or thereabouts, and if the land is rolling and contains hardpan the expense may reach from fifty to one hundred dollars per acre. The more "naturally" level the land is the better suited it is to raisin-vines under irrigation.

Irrigation and cultivation, until the vines come into bearing, including suckering and pruning, all in large tracts of from forty to one hundred acres, ten dollars per acre. If in smaller tracts the expense will be larger.

Pruning when the vines are in bearing, from two to three dollars per acre.

Sulphuring twice, two dollars per acre. Sulphur costs from two to three cents per pound. It takes about one ton to twenty-five acres and one man can sulphur from five to six acres a day.

Topping, about fifty cents per acre.

Trays, twenty-four by thirty-six inches, cost ten cents in shooks, nailing one cent, nails one cent, total about twelve cents per tray.

Sweatboxes, fifty cents apiece when ready.

Packing-boxes: Wholes of twenty pounds, in shooks, six cents, nailing and nails two cents, total eight cents each. Halves of ten pounds, in shooks, four cents, nailing and nails one and one-half cents, total five and one-half cents. Quarter boxes of five pounds, in shooks, three and one-half cents, nailing and nails one and one-half cents, total five cents each.

Twenty pounds of layer raisins will contain about one-half pound of stems.

Cost of curing cannot be calculated. It depends upon the manner in which it is done.

Picking: One man can pick from twenty-five to fifty trays of twenty pounds each a day, at a cost of say from two to three cents per tray, or about a half a ton of grapes a day, equal to a cost per ton of two dollars and fifty cents. This places the grapes on the trays, but does not assort them. By assorting the grapes when picking, the cost is increased, but better raisins and more good raisins are obtained.

Turning: Two men can turn twenty acres of grapes a day.

Packing London Layers: One man can pack "carefully" ten wholes or forty trays (of five pounds each) per day. Cost about twelve and a half cents per box.

Packing Dehesas: One man can pack ten quarters of five pounds each a day. Cost twelve and one-half cents per quarter box. This includes facing.

Packing Loose: One man can pack one hundred boxes per day.

Facing-plate (T. C. White's): Large plate, size nine by eighteen inches, five dollars per plate. Cartoon plate, size five by ten inches, two dollars and fifty cents per plate.

Manilla paper for sweatboxes, one hundred and fifty pounds per ream at fifteen dollars per ream, size thirty-six by forty-eight. The sheets to be cut in two to fit the boxes.

Stemming: Steam stemmers can separate and assort fifty tons a day. Hand stemmers run by two men can separate about five tons per day.

Papers for boxes cost, according to quality, three cents per box, more or less.

THROUGH THE CALIFORNIA RAISIN DISTRICTS.

THROUGH SAN JOAQUIN VALLEY TO FRESNO.

We are on our way up the valley. The train left San Francisco in the morning. We have crossed the bay and rounded the Contra Costa Mountains, and Mount Diablo, with its majestic twin peaks, lies already behind us. We have just crossed the San Joaquin river not far from its mouth; the west side of the valley is on our right; on the left looms up the Sierra Nevada, far away it is true, but grand and imposing, gradually decreasing, as it were, towards the south, finally to disappear among the clouds at the farther end of the valley. It is in the middle of August; the day is warm, but there has been a shower in the mountains, as is usual at this season of the year, a sprinkling of rain has purified the atmosphere in the foothills, which stand out clear and bright, a contrast to the dusty road in the center of the valley, over which the smoking train carries us at a rapid speed. On both sides of us stretch apparently endless plains, thirty miles wide,—to the Coast Range on one side, to the Sierra Nevada on the other,—plains dry and yellow, parched in the brilliant sun, shaded by no clouds, but cooled by a steady breeze from the northwest following us up the valley. Up, we say, but it is hardly any more up than down, the ascent being about one foot to the mile; it is rather a journey over one of the most level plains on the continent, but still the popular usage insists upon saying "up the valley." Acres and acres of already harvested grainfields are seen on both sides, crossed by roads at right angles; here and there are stacks of grain which have not yet been threshed, or heaps of straw, where the threshing engine has done its work; on almost every section of land we see a farmhouse and barn, a few gum-trees or cottonwoods, and many a windmill and elevated tank informs us where the farmer gets his water for his house and his scanty trees. All this we see under a blazing sun and a quivering air.

This is the great San Joaquin valley, the fertile center of California. Of the much spoken of irrigation of California, we see almost nothing; the land is dry and thirsty, the soil is loose, and the engine forces the dust in a cloud before us. Nothing green is seen anywhere except a few scattered trees far, far apart. Here and there we pass a little town with wooden houses and dusty streets, with wooden churches whose spires do not pierce the sky. We cross many streams, several of which are dry, or have sluggish waters, while some wind their way down the valley between banks covered with willows and cottonwoods. Yet there is something grand in this immense stretch of open, level country, with its frame of snowy mountains, with its fertile fields waiting for the winter's rain or irrigating ditch to produce abundantly of almost anything that can be grown in any temperate country in the world. The numerous grain stacks speak of the fertility of the soil and of abundant harvests, while the vegetation along the rivers indicates that water is all that is needed to make this large valley like a fruitful garden.

We have passed Lathrop and Modesto and numerous smaller stations between; the picture is everywhere the same. At Atwater we met the first signs of irrigation, and saw young vineyards and orchards on either side, and as we approach Merced we pass large irrigating ditches flowing with water, and in the distance many houses and farms. The country is getting greener, and the deep color of the soil is a sign that it is rich and fertile. At Merced there is a Yosemite air. The large El Capitan Hotel stands out like a landmark, and the garden with its flowers and shade trees, and the marble fountain with its rippling waters, speak loudly of beauty and refinement.

Close to Merced are situated some of the new promising colonies which are making raisin-growing one of their specialties, and in whatever direction we look we see signs of such new enterprises, all young, of course, as irrigation has only lately been brought in here, where no dense settlements could exist without it. Much of the land is yet held in very large tracts, but they are being rapidly subdivided and sold out to actual settlers as fast as there is any demand for them. To our right lies a splendid body of perfectly level land occupied by the Yosemite Colony with many settlers already on the land, whose new and cosy cottages mark their future homes.

In the distance, on the slope of the low hills, stand out prominently a number of houses, some of them quite pretentious, white and gleaming in their new dress. This is the Rotterdam Colony, a settlement of Hollanders who have only lately arrived here. There is not a colony anywhere which promises to be more interesting, and which is likely to prove a greater success. The Dutch as a people had succeeded with colonization long before any other nation began a similar work, and, as immigrants to this State, they are most desirable. Industrious, saving, intelligent and persevering, with good land, plenty of water at all times of the year, and with a good location which insures health and comfort, there is no reason why they should not succeed. The colony is most beautifully situated on high sloping ground,—a veritable mesa land overlooking the vast Merced plains, and only four or five miles distant from the city. These Hollander colonists are the very best kind of settlers the State can get,—not the ignorant peasantry of Europe, but intelligent and well-educated people, which any community can be proud of. There is great activity in the colony just now. Thousands of acres are covered with magnificent grain, which, without any more rain, would give a profit of from twenty to twenty-five dollars per acre, and thus materially help to pay for the land. A hundred or more horses and mules with their drivers are plowing and harrowing the soil; and such a plowing is not often seen anywhere. The plows are set about a feet deep, and the work is done by the canal company just to help the settlers along and give them a good start. What more can they expect? Good treatment is in Merced dealt out to everybody, —a good policy which should be followed in every new colony in the land. We stop at the newly-built house of Mr. Canne, a gentleman of middle age with a large family, and hearty and pleasing, as is so characteristic of the Dutch. His house is large, very comfortable and airy, with large verandas overlooking the country far and wide. Inside everything is cosy and neat, with lots of mementoes from quaint old Holland, with colored china on the walls and odd tables and odder bric-a-brac, family heirlooms from generations back. The old grandma, with her eighty-one years, has come along with the younger folks, happy as they, and, as they, meeting bravely and with confidence new times and experiences in the new country which they have chosen as their home. Our wishes for good luck are not needed; it is sure to come when such people are settled upon such land, and when everybody enjoys everybody else's good-will. The land which is now being broken is to be planted to olives, almonds, oranges, peaches and vines, —a very good selection indeed, and one which cannot fail to prove profitable. The deep red soil on the mesa will grow almost anything, and with proper care and management this colony must in the near future become one of the most attractive and prosperous in the State.

The Rotterdam Colony is bounded on one side by the now famous and often described Crocker and Huffman reservoir. Those who believe that a reservoir in the foothills is not the proper thing should come and take a look at this one, and be convinced that it is. The location is a most favorable one, being ninety feet above the town of Merced, and elevated sufficiently to irrigate the whole of the level surrounding district, containing two hundred and sixty thousand acres. The water covers now about six hundred and forty acres which were formerly a real and natural valley, across the mouth of which the dam checking the water was thrown. The average depth of water is about thirty feet, while in some places it is fifty odd feet deep. The statistics of this reservoir and dam have been given often enough, but more or less correctly. The dam checking the water is four thousand feet long, two hundred and seventy-five feet wide at the base, twenty feet on the top and sixty feet high in the center. It took four hundred mules and two hundred and fifty men two years to build it. The reservoir and canal tapping Merced river cost together two million dollars to build, and the work was constructed in such a substantial and scientifically correct manner, that it will be likely to last for ages. There is no other irrigation system in the State that is as well planned and carried out. This can and must be said to the honor of the constructors. The canal which taps the river is twenty-seven miles long, from sixty to seventy feet wide on the bottom, one hundred feet on the top, and has fall enough to carry four thousand cubic feet of water per second.

We have already remarked that the country between the dam and the city of Merced is a magnificent and level body of land, all eminently suited for irrigation. From the water tower in the reservoir, we overlook all this land, now in its spring dress a very beautiful sight indeed. The vast sheet of water, like a placid lake, in which the Sierra Nevada reflects its snowy peaks, the prairie extending far and wide, divided between luxuriant grainfields and unbroken lands now covered with their spring carpet of flowers in the colors of the rainbow,—yellow, white, blue, violet, red and shades of each, and dotted over with the new settlers' homes, freshly built and freshly painted,—what more lovely view could we wish, a sight of beauty and of plenty. As we drive back to town, we are more than at first impressed with the lay of the land. The surface is level and without hills or knolls, but is cut through by many natural channels or creeks from fifteen to twenty feet deep, insuring a natural drainage, invaluable in a country where irrigation is required.

The soil in this part of Merced county appears to be made up entirely of alluvial deposits from the various creeks which in winter irrigate the plains with their natural overflow. The largest of these creeks is Bear creek, its deep channel resembling rather an irrigation ditch constructed on the latest engineering principles than a natural stream. Its banks are even and slanting, while its bed is deep below the surface.

But our time to stay was short. We have left Merced and many smaller towns behind us, crossed many more dry streams, and passed the large vineyards at Minturn, where sherry and port of excellent quality are made. We have again crossed the main channel of the upper San Joaquin, not far from where it emerges from the Sierra Nevada, its silvery waters winding their way over the thirsty plains between steep and barren banks. We have crossed a few irrigating ditches full to overflowing with water, and see a few orchards and vineyards with their bright green scattered about on the yellow plains. There is suddenly a general stir in the cars, hats and bundles are taken down from the racks, most of the passengers prepare to move, the locomotive whistles, houses and trees are seen on both sides through the car windows, the train comes to a standstill, there is a hum of voices, a waiting crowd swarms around the cars, a throng of people pushes in, and another throng pushes out. We are among the latter, as we are now in Fresno, the largest raisin center on the continent.

Fresno, as seen from the railroad station, is not as inviting as it might be, and the thousands of travelers who pass by on the cars, headed farther south, can judge but little of the town and the district behind it. The country is so level, that the only way to get a good view of the country is to ascend some elevated building, the courthouse being the highest, and through its location the best suited building for the purpose. The early forenoon, before the noonday sun has acquired its full power, is the best time for this. Once up there, the view is decidedly magnificent, and more extensive than we had ever expected while below. Under us lies a lovely park of trees, —umbrella, elm, locust and fan palms, covering about four blocks. From it stretch the regular streets in all directions, lined by cottages as well as with costly dwelling-houses, shaded with stately trees of various kinds. The business portion of the town presents itself particularly well,—large and costly hotels, with comforts that the tired travelers enjoy so much, imposing bank blocks of brick and stone, with towers and ornamental roofs, solid structures with continuous lines of stores, etc., mark this part of town. For a mile in every direction the town stretches out, the center thickly built, the outskirts with sparsely scattered houses. Adjoining these the country begins,—vineyards as far as we can trace, groups of houses shaded by trees in different tints of green, while broken rows of endless poplars traverse the verdant plains and lose themselves in the distant horizon. The Sierra Nevada, with their snowclad summits, and the Coast Range in the west, cloudy and less distinct, form the frame for two sides of this attractive picture, while to the north and the south the open horizon, where sky and plains meet, limits the extensive view.

The street-car lines of Fresno do not run very far out in the country, and to see the latter we must procure a team. The colonies or settlements of small farms immediately join the town limits; we are thus with one step out in the country. On either side we see continuous rows of vineyards,—the leaves green and brilliant, the vines planted in squares and pruned low, with the branches trailing on the ground. To begin with, the houses stand closely, almost as in a village. As we get farther out there is a house on every twenty-acre farm, or every one-eighth of a mile. The cottages are neat and tasty, surrounded by shade trees, while rose-trees and shrubbery adorn the yard, and climbers shelter the verandas from the sun. At every step, almost, we pass teams going in various directions,—teams loaded with raisin boxes, teams with raisin trays, teams crowded with raisin pickers hurrying out to the vineyards, teams driven by raisin-growers or colonists generally, who rush to and from town to transact business connected with their one great industry. Everywhere is bustle and life; every one is in a hurry, as the grape-picking has begun, and the weather is favorable; no one has any time to lose. Some of the avenues are lined with elm-trees, others with fig-trees, with their luscious, drooping fruit, others again are bordered with evergreen and towering gums, with weeping branches and silvery bark. Every acre is carefully cultivated; there is room for only a few weeds. As far as we drive the same scene is everywhere, a scene like that in the outskirts of a populous city, where villas and pleasure grounds alternate with the cultivated acres, here those of the raisin-grower, and where every foot of ground is guarded with zealous care and made to produce to its utmost capacity. It is a pretty sight, a sight of thrift and intelligence, of enterprise and of success, of wealth and of refinement, found nowhere else outside of the fruit-growing and raisin-producing districts of California.

The raisin harvest has just begun; the vineyards are full of workers, grape-pickers are stooping by every vine, and are arranging the grapes on small square or oblong trays, large enough to be easily handled; teams with trucks are passing between the vines distributing the trays or piling them up in small, square stacks at every row. Some trays with their amber grapes lie flat on the ground in long continuous rows between the vines, others again are slightly raised so as to catch as much of the sun as possible. In some vineyards the laborers are turning the partially cured and dried raisins by placing one tray on top of another, and then turning them quickly over. In other places, again, the trays with the raisins already cured are stacked in low piles, so as to exclude the sun and air, and at other stacks a couple of men at each are busy assorting the grapes, and placing the various grades in different sweatboxes, large enough to hold one hundred pounds each. In every vineyard, large and small, we find the hands at work, and every one able and willing to do a day's work is engaged to harvest the large crop. The most of the pickers are Chinese, at least in the larger vineyards, while in the smaller vineyards, where large gangs of men are not absolutely necessary, white men and boys are generally employed. The fame of the raisin section and the harvest has spread far and wide, and at picking time laborers gather from all parts of the State to take part in the work, and find remunerative wages at from $1.25 to $1.50 per day. The country now swarms with pickers of all nationalities,—Germans, Armenians, Chinese, Americans, Scandinavians, etc., and as the schools have closed in order to allow the children to take part in the work, boys of all sizes are frequently seen kneeling at the vines.

The crop this year is very heavy, many vines yielding two trays or even three, containing twenty pounds each, and, as the trays are generally placed in alternate rows between the vines, we see, as we pass, continuous lines of them filled with grapes in various stages of curing, from the green to the amber-colored and the dark of the fully-cured raisin. The aroma from the drying berries is noticeable, and the breeze is laden with the spicy and pronounced odor of the Muscatel raisins.

The average size of a colony lot is twenty acres. Many settlers own two or three lots, a few owning four or five. But it must not be understood that the whole of these lots are planted to raisin grapes. While most of the larger tracts are almost exclusively planted to raisin grapes, the smaller farms of twenty acres contain as a rule only a few acres of vines, the balance being occupied by alfalfa, berries, garden, fruit trees, and yard for houses and barns. From three to fifteen acres of raisin-vines are found on every twenty-acre farm; none is without its patch of raisin-vines. We step off and inspect many of the places, large as well as small. Magnificent vineyards are owned by T. C. White, one of the oldest and most successful vineyardists, and by other parties, only second in importance to his. The vineyard of the late Miss Austin is yet in its prime, the evergreen trees and hedges being as inviting as in days of old. New vineyards which have not yet come into bearing are seen on every side, while in places whole orchards or single rows of trees have yielded to the axe to be replaced by the better-paying raisin-vines.

Some of the best-paying and largest vineyards are found east of Fresno City. From the very outskirts of the city we pass through raisin vineyards, very few fields being planted with anything else. Near the town some vineyards have given place to town lots, and whole villages are growing up in the old vineyards. We pass by the large vineyard of Frank Ball, containing about 120 acres, all in vines except a small reserve for house, barn and alfalfa field. Adjoining on the same road is the Bretzner vineyard of forty odd acres, the vines loaded with grapes. We turn to the left and, passing the vineyards of Merriam and Reed, see on our left the magnificent Cory vineyard of eighty acres, bordered by a wonderfully beautiful row of umbrella trees, with crowns as even as veritable gigantic umbrellas, and through the foliage of which not a ray of light can penetrate. A little farther on, also to the left, is the Gordon vineyard, lined by fan palms and fig trees. A large sign across the main road announces that we now enter the Butler vineyard, the largest and most famous vineyard in the State, with its six hundred acres nearly all in vines,—the largest vineyard in one body and owned by one man in the world. Magnificent avenues of poplars, magnolias and fan palms stretch in various directions leading to the outbuildings, of which the packing and drying houses appear most prominently. Mr. Butler's home is one of the most attractive, shaded by umbrella trees and majestic fan palms, and surrounded by flowers and evergreens. From his vineyard alone over five hundred carloads of raisins have been shipped, the yearly product being over one hundred thousand boxes of raisins,—a thousand tons. The vineyard now swarms with laborers; the teams wait in long lines to load the ready raisin-boxes, while the spaces between the vines, as far as we can see, are almost covered with continuous rows of trays, all loaded with Muscat grapes in all stages of drying.

We travel constantly eastward; on both sides are raisin vineyards, large and small. The four hundred acres owned by the Fresno Vineyard Company are devoted to wine grapes, and large wineries and cellars built of adobe show the wealth and extensive business of the place. No vacant land anywhere, nothing but vineyards, the only breaks being groves of trees shading the homes, wine cellars or packing-houses of the proprietor. Farther to the north lies in an unbroken row the well-known Eisen vineyard, where the first raisins were made in this district, but where now principally wine is produced; the Nevada and Temperance Colonies, devoted mostly to raisins; the Pew, the Kennedy, the Forsyth, Woodworth's, Duncan's, Goodman's and Backman's raisin vineyards, all splendidly cared for and lined by fig trees. Of these the Forsyth vineyard deserves more than a passing notice, as it is more inviting to an hour's rest than any other. Containing 160 acres, nearly all in vines, it is one of the best properties of the county. The place shows an uncommon taste and refinement, and is beautified by avenues of poplars and magnolias, by groves of acacia and umbrella trees, by palms and flowers, and by roses and climbing plants. A pond with its lilies, overhung by weeping willows and shaded by stately elms, is an unusual sight even in this county of abundant irrigation. The packing-houses and dryer all display a taste and practical arrangement hardly seen elsewhere. A climb to the top of the tank-house is well worth the trouble. The view becomes wonderfully enlarged; we overlook the level plains, all in vines, with houses and groves scattered about like islands in a sea,—no wild, unbroken country anywhere. In the distance is Fresno City, to the north the view is hemmed in by new vineyards and colonies,—a mass of trees and vines in straight and regular rows. The courteous owner conducts us through his packing-house and shows us how the bunches are placed in layers and carefully made to fit every corner in the box, how the boxes are covered with papers and artistic labels and finally made ready for the market. As we pass out we get a glimpse of the equalizing room, crowded to the ceiling with sweatboxes, in which the raisins assume an even and uniform moisture. And what luscious bunches they are, large, sweet, thin skinned and highly flavored. Malaga produces nothing better, and much not as good. And, when we are all through tasting and admiring, we are invited into the cosy and artistically furnished dwelling, where in the cool shade the lunch and the rest are as welcome and interesting as the vineyards and packing-houses outside.

As we turn again towards town, we pass the well-kept Goodman vineyard, after which we enter the large Barton vineyard, now partly owned by an English syndicate. The old 640 acres are nearly all in wine grapes, while several hundred acres of young raisin grapes have lately been added. One of the most extensive wine cellars in the State is found here, all kept in splendid shape,—hardly a speck of dirt, not a foot of waste land seen anywhere. The mansion is stately, situated on a small hill surrounded by fine groves of gum-trees, evergreen hedges and ornamental grounds. Should we care to go farther east, we might visit the Eisen vineyard, where the first Muscats were planted in the county. The famous avenue is half a mile long, and one of the most beautiful in the State, lined on both sides with blooming and beautiful oleanders alternating with poplars over a hundred feet high. We might also visit the Locan vineyard and orchard, and admire the orange-trees, which speak of what the country can produce in this line. But the time is too short; we might travel a week over this level but beautiful country, and every day, every minute, see something new and interesting among all these vineyards, with their packing-houses, and raisins exposed on trays to dry.

When we return to town, a visit to the packing-houses is one of the most interesting that can be made. Of these packing establishments Fresno has four or five, besides several in the colonies or in the larger vineyards. Three of these packing-houses are the largest in the State. The building of each one of them, though large, is full and overcrowded. Women at long tables pack the raisins in boxes, at other tables men weigh and assort raisins and take them out of the large sweatboxes in which they left the field. At some tables fancy packing is done, and women "face" the boxes by placing large selected raisins in rows on the top layers. At another table the raisin-boxes are covered with fine colored labels, then nailed and made ready for shipment. Some four hundred men and women are busy with this work under one roof, all earning wages of from one to two dollars a day each. We catch a glimpse of the equalizing room, where fifty tons of raisins are stored at one time for a week or more in order to become of even moisture, the floor being sometimes sprinkled with water to make the air sufficiently moist. As we go out we see the raisin-boxes already packed being loaded on cars and shipped east by the train-load, from four to six such raisin trains leaving every week, each train of from ten to twenty cars. On the other side of the packing-house is a continuous row of teams from the country, all loaded with raisins, brought by the country growers to the packers in town. It takes a gang of men to receive, weigh and unload them. In another department we see the large stemmer and grader, which runs by steam, and stems and assorts from thirty to forty tons per day, the clean and uniform raisins running out in a continuous stream, each grade in separate boxes. There is a restless activity on every side. The large raisin crop this year is very large; it must be handled in a few months, and every grower and packer is pushing the work to his utmost ability.

When we consider that most of the crop, which this year will reach five hundred thousand boxes, comes from the country immediately surrounding Fresno City, and that the San Joaquin valley is 250 miles long by 75 miles wide, almost all the land capable of being highly cultivated and of producing abundant crops of one thing or another, then alone can we realize what the future has in store for this wonderful valley, an agricultural empire in the very center of California.

FROM LOS ANGELES TO SANTA ANA.

We are fairly out of Los Angeles when the character of the scenery changes. The railroad here runs through one of the most fertile counties in the State,—the rich bottom lands being formed by the deposits of ages from the overflow of rivers and creeks from the Sierra Madre range. Not an acre of waste land is to be seen anywhere. Everything is clothed in the softest green, and only in the far distance are seen the hills and higher mountains of a brownish violet color, with the boldest outlines against the sky. A more diversified farming district is seldom seen. Orchards of prunes, walnuts, apples and figs are met with on either side of the track, here and there expansive vineyards with their characteristic green, or groves of straight and stately gums, like immense square blocks of verdure, planted all along from the nearest fields to the far distant hills. We pass in succession Ballona, Florence, Downey and Norwalk. The country around the two latter places seems especially attractive,—orchards as far as we can see, vineyards and native pastures. We pass villages and farmhouses, here and there a more pretentious villa, and, in some spots more lovely than the surrounding, many a mansion has been erected with luxury and taste.

We are soon in Orange county, and the scene changes some, the soil being, if possible, more fertile. We pass large orange groves of the deepest green, and immense fields of corn, squashes, pumpkins, peanuts, beans, and here and there walnut groves and plantations of young fig trees. Anaheim, Orange and Santa Ana come in quick succession; we are in the center of a raisin district of the very greatest interest. We can hardly realize the change. Not having been here since the boom, everything seems almost new. Santa Ana has grown to be the queen of the valley, and is undoubtedly, together with its two sister cities, Orange and Tustin, one of the most prosperous as well as lovely places to be found in the beautiful South. As we board the street car and ride up town from the depot, we realize the change even more. On every side are signs of wealth and refinement, of new ideas and new capital, both mostly imported from the East. Broad avenues one hundred feet wide, on either side, lined with trees of various kinds, cultivated fields immediately beyond, which, with cottages, villas and churches, all speak of a prosperous and intelligent population.

Santa Ana has her share of these stately structures. The Brunswick is as fine and substantial a building as any one could wish,—lofty and airy and of imposing architecture, large rooms and spacious halls. The boom that has been so much misjudged has done much more than settle up the country and bring capital. It has left behind substantial improvements and a taste for architecture, the arts and sciences, which can but be of permanent value to the country. It brought the country at one bound from its former frontier life and characteristics to a high degree of civilization and refinement. It brought capital, soil, climate and energy together in a way that is hardly found anywhere else out of our State. The boom is over, but the benefits of the boom are yet here, and are permanent.

Santa Ana, Orange and Tustin are like three precious stones in a ring of verdure. Only a few miles apart, they are like the villas on the outskirts of a central imaginary city, from which the wealthy and poor likewise fled to a more retired country life, to enjoy both seclusion and society, both the pleasures of country life and the advantages of an active city, where every luxury and necessity can be found at the door of every home.

Santa Ana has a fine, large, central business street, with new and costly brick blocks containing stores of every description. In this climate, however, we can see no necessity for ice, and the manufacturer and mixer of cool drinks can but find his business unprofitable. Up and down this street a line of cars runs all day long at fixed hours, connecting with other lines in Tustin and Orange. A trip or two on any of the lines is one of real pleasure.

Tustin is only two or three miles away, nearer the hills. The car, an open one with many seats, winds its way under shady lanes on either side, bordered by large and graceful pepper trees covered with spicy and fragrant blossoms. Here and there we see alongside the pavement an enormous sycamore tree, a monument of olden days and the native vegetation of the country. On both sides of the avenue are sidewalks of cement, and they who prefer walking can do so for miles under the shady trees without getting dusty or becoming heated by the sun. These sidewalks are marvels of beauty and comfort. On one side are old and graceful trees with drooping limbs, on the other are well-kept cypress hedges trimmed square and even, or long natural barriers of ever-blooming geraniums in numerous varieties, of every favorite shade of color from crimson to palest pink. Over the hedges we look into blue-grass lawns, green and well kept and exceedingly attractive. Suddenly we are in the middle of Tustin City. A beautiful, even magnificent bank building on one corner, a store on the opposite, two or three smaller shops and the inevitable splendid and elaborate hotel, and the town is fully described. Immediately adjoining are the beautiful and evergreen lawns and trees,—the city and country actually combined.

A trip to Orange reveals the very same features, only we pass through a more fertile country, with vineyards and orchards on every side, orange groves of various ages, walnut orchards, fields of tall corn, peanuts, beans and melons. Between all wind the shaded avenues with pepper and gum, cypress, pine or yellow flowering grevillea. The soil is everywhere of the richest kind, of a color between ashy green and chocolate. Nowhere have we seen such magnificent Indian corn,—whole fields where the stalks are from twelve to sixteen feet high. Orange is a more pretentious town than Tustin, but hardly any more beautiful, and far less secluded and quiet. There are two large and fine hotels, the one of brick being in town, while the other, the family hotel, lies in the suburbs in bowers of evergreen trees and gardens. In the middle of the town there is a plaza with a fountain and an exquisite little garden well planned and better kept. The lawns are like the softest velvet, and are bordered with blue and green flowers, with beds of sweetest mignonette, while bananas and palms spread their stately foliage in the center.

The climate of this part of Southern California is excellent. The thermometer stands at midday at eighty in the shade; in the evening there is always a breeze. Many of those I meet complain as usual, and greet me with the inevitable, "How warm it is to-day," and our as inevitable answer is, that we cannot feel it, and that it just seems delightful to us. People here observe and feel the changes of temperature much more than we do farther north. With us they share the habit of complaining, even if there is nothing to complain of.

The vineyards of Santa Ana have suffered much from a vine disease which may be compared with consumption or the Oriental plague in man. But every one thinks here that the pest will run its course and become harmless, and even now some of the vineyards are being replanted with fresh vines. The oranges do eminently well, but they must be sprayed and constant watch kept for the red scale imported here from Australia by an enterprising nurseryman. The plantations of walnuts are being rapidly extended, and nurseries of young walnut trees just appearing above the ground are seen in many places, the plants probably amounting to millions. The walnut generally planted is the seedling soft-shell and the common Santa Ana walnut, than which there is none choicer and more valued on the coast. Prunes are also a favorite crop, and pay well if not allowed to overbear, in which case the succeeding crop will be small. The same may be said of the apricot. These trees are here fine and healthy, and of a deeper and finer green than is seen almost anywhere else; but last year the trees bore too much, and this year the crop is by far not what it should be.

The resources of this country are such that the partial failure of a single crop will cause no serious injury. New resources are developed every day; there are few plants that do not thrive here. In the gardens as well as in the fields we see the tender semi-tropical plants, which cannot stand any frost, growing close to varieties from the North. Bananas, date palms, walnuts and oranges grow in the same field with peaches, apples and prunes. Pepper and camphor trees and the tender grevillea are on one side of the avenue, while on the other side we may find elm, eucalyptus or even the beautiful umbrella.

Irrigation is practiced on every farm. Fifteen thousand acres are covered by water stock, but not all irrigated yet. Just now the orange groves are irrigated, and I observe their methods. The land is always leveled before anything is planted, as there is too little water here to waste any on unlevel land. One way to irrigate an orchard is to plow furrows in between the rows of trees, and then let the water run in them. Another way is to check the whole orchard with small levees, inclosing thus a little square around every tree, and the square check of one tree meeting the same of the adjoining tree. This is actually flooding the land. Deciduous trees and vines grow without irrigation, but to get a good crop irrigation is necessary. The large, dry and rocky creek beds speak of the water that is wasted in winter time in flowing to the sea. Practically nothing of it is then saved. Irrigation districts under the Wright law are formed and forming, and everybody seems hopeful that in course of time there will be water enough to irrigate all the land that is good enough to be irrigated. Some of the finest ranches in the State lie right at the feet of Santa Ana. The San Joaquin ranch contains one hundred thousand acres, I am told, and it is not yet cut up, and thus some of the best land around Santa Ana is yet only used as pasture. The owners failed to sell in the time of the boom and must now wait until the land that is already covered with ditches will be fully settled before they can sell, but the time, we predict, is not very far off.

SANTA ANA TO SAN DIEGO.

A railroad trip from Santa Ana to San Diego offers many points of interest. It carries us through both the most highly cultivated and through the absolutely vacant, not to say barren, lands. We leave the orange grove and walnut plantations of Santa Ana, and are carried almost immediately past the lovely and shaded Tustin, where pepper groves and lime hedges, gardens and splendid villas, combine nature with art, taste and enterprise to create a veritable oasis for those favored ones who can remain there. We rush for a few minutes through these highly cultivated lands, and suddenly find ourselves out on a wide, open plain, comprising about eighty thousand acres, without a house to be seen anywhere, with no orchards, no vineyards, no signs of civilized life. And still the soil is the richest, the native vegetation of grasses the most luxuriant. The soil is apparently subirrigated, and could grow almost anything the farmer might plant there. Along the horizon, stretching from the mountains way down on the plains like an immense plumed serpent in its wavy and coiling track, is seen a continuous band of sycamore trees, outlining the bed of a stream. It is like stepping out of one room into another. What can be the reason of the sudden change? This vast body of land, containing over 126,000 acres, is an old Mexican grant, the remnant of one of those Mexican cancers, which to such an extent has retarded the development of California. Sure enough, we see wire fences everywhere, and cattle with spreading horns and sheep without number. But we see no sign of the cultivator, no horses, no signs of progress. The owner held onto the land, probably expecting it to bring a price many times the sum it was worth. He died, and so died the boom, and now the land is under administration. When the time comes that this large San Joaquin grant can be sold to farmers in small tracts, it will very greatly increase the cuitivable area of Orange county.

But we pass on, leaving the open country; we are soon in among the rolling lands, among foothills not unlike those of the Sierra Nevada in the San Joaquin valley. To the left are the San Bernardino Mountains, here and there a peak of boldest outline, and streams and cañons winding their way to the sea. At El Toro a number of passengers got off to take the stage to Laguna, a seaside hotel, where the farmers and business men of every color, from the heated interior valleys, delight to spend a day in fishing, hunting for abalones, or in watching the breakers roll against the sandy beach. A little farther on we stop at El Capistrano, or rather at San Juan Capistrano, the old ruined mission, situated in the most beautiful little valley, with its winding and sycamore shaded creek. The mission must have been one of the very largest in the State. The ruins are yet very extensive, consisting of long and regular adobe walls, and one-half of a yet magnificent looking church, in the regular Spanish style of architecture. A rather large size town of Mexican houses, with a Mexican population, and venerable fig trees, tall and wavy palm trees, and large but unkempt gardens, give the place a rather more important look than it perhaps deserves. There is but little sign that the boom was ever here. Still the valley is so beautiful and evidently so fertile, that it needs only work and taste to make it equal to the very best. We see yet the old mission pear trees, large and untrimmed, not unlike our drooping oaks, loaded with pears to such an extent that there appears hardly room for a blackbird to get through. The mission grapevines are all dead. Gigantic vines, which covered trellises and arbors, and which perhaps bore tons of grapes, with trunks as heavy as the body of a boy, are there yet, but without leaves and young shoots; they are dead, having surrendered to the vine pest of the country.

After leaving Capistrano we follow the little creek to the sea. The valley is from one-half to one mile wide. Here and there are flourishing little vineyards, but mostly pastures and cornfields or patches of beans. At last we reach the sea, the Pacific, calm and blue, with breakers lashing the shore. To the right we leave the rocky promontory of the Capistrano Mountains, and for an hour or more run on the very beach. In stormy weather the spray of the breakers must wet the cars, which run only a stone's throw from the water's edge. This part of the route is the most interesting and the most refreshing to one coming from the interior plains. We are now in San Diego county. The shore is abrupt and bluffy, the hills bordering on the sea.

At Oceanside we meet the first of the boom towns, one of those that sprang up for pleasure and profit, towns of magnificent villas, broad streets and avenues, lined with infant blue gums, with rows and hedges of the ever-bright geraniums, and with large and splendid-looking hotels, with airy balconies, verandas and lookout towers, swept by the fresh breezes of the sea. The vicinity of every such station is heralded by the characteristic white stakes that mark the town lots, and by rows of small, intensely blue, gums; by a sprinkling of cottages, small and large, perhaps a mile or two before the whistle of the steam-engine brings us to a standstill. The first things that meet our eye at every station are large and splendid lawns, young plantations of palm trees and other plants characteristic of the Southern coast climate, flowers of brightest hue, all started by the enterprising immigrants who came here to buy climate, sun and air, and to enjoy the breakers and the ocean every day in the year. After Oceanside, we touch at Carlsbad and Del Mar, both seaside resorts with magnificent villas costing from twenty to forty thousand dollars each, and with fine but young plantations and gardens. I was especially charmed with Del Mar, with its large, tasteful hotel on the bluff, and quite a large colony of villas and mansions in various sizes and styles close around,—a bright and charming picture, a place where a traveler feels at home at once, where he would like to pass the balance of all the days he can spare from business and toil.

The scene changes again as the cars carry us through the foothills, along the bed of creeks, or across lagoons connected with the sea, or over gaping chasms. We look down deep into the valleys below, where shady sycamores and white cottages mark the farmers' homes, and where vine-clad hills offset the native brown of the country. I am surprised to see how the grapevines thrive so luxuriantly so very close to the shore. In some places there are fine and thrifty vines within a stone's throw of the breakers, only protected by a slight undulation in the ground from the most direct wind. Of course, grapes on those vines cannot be expected to be very sweet; it is wonderful enough that they are there at all.

The water supply of this part of San Diego county has been very much underrated. The railroad crosses perhaps a dozen different creeks, all showing living water, and which are far from being entirely dried up. With a Supreme Court more enlightened, and with proper legislation as to the needs of the country, San Diego county may yet be able to store water enough to irrigate very large areas of land, where colonies of thrifty farmers may create and maintain prosperous orchards and vineyards as a support and backbone to the many pleasure resorts.

But we are out of the hills. Smiling and glistening in the evening sun lies San Diego Bay, with the elevated Point Loma, the ever-present breakers on the bar, and away out on the low peninsula the gigantic and turreted pile of the Hotel del Coronado, to say nothing of San Diego itself, with its miles of marked town lots and villas. But I shall not endeavor to describe this town and its bay and climate. The latter may possibly not be excelled anywhere; the former lacks a most essential thing,—an abundance of trees and vegetation. Still, with the water that has lately been brought here the trees and flowers will come soon enough we hope, when green lawns, bananas and palms will be ready to tell the tale, and young plantations will be seen on the hills and around roadway homes. But I forget I am bound for El Cajon and its raisin vineyards, and must catch the train.

EL CAJON.

The country lying between San Diego and El Cajon does not at this time of the year present many attractive features. The little train, consisting of a locomotive, tender and a passenger car, wriggles itself between brown, rolling hills, over small cañons, dry and sandy, without any other vegetation than grass, and here and there a few evergreen shrubs. Close to San Diego we pass along the Chollas valley and creek, where an attempt has been made at colonization, as we understand it in the San Joaquin valley. The land is divided up in ten and twenty-acre tracts and dotted over with small and unpretentious cottages, as well as with fine and expensive mansions. Young orchards of pears, olives, prunes, oranges and figs are seen wedged in between vacant and unbroken land. In the river bottom are Chinese gardens, with windmills, and patches of cabbage, corn and small truck. Much of this land is irrigated with water from the Sweetwater dam, some twelve miles away on the Sweetwater river. On the bottom land there are a few Muscat vineyards, for the supply of the San Diego market. I noticed the grapes there. They were of the Muscat of Alexandria variety, very large and fine both as to bunch and berry, and very sweet. I have seen no finer Alexandrias anywhere.

But we have hardly time to observe this cultivated spot before we are out again among the rolling hills. The engine pants heavily, and we are constantly ascending. The same low hills everywhere,—no settlers, no gardens, no plantations of any kind. The soil is brown adobe mixed with gravel and small boulders; in fact there is nothing to see and admire. For twenty miles there are two or three small stations, but there were no station houses to be seen nor any settlements around. The railroad is apparently made to tap a better country in the interior. But even in this uninhabited country the boom started to penetrate in earnest. Large signs announcing the sale of town lots, wide streets once plowed up across each other at right angles, square blocks which are plowed around or otherwise mapped out, here and there a white post with a number and a name, and we have a good idea of a town where the lots sold for $250 apiece or more.

All at once the engine whistles, the area widens and we see in front of us a large, flat valley, apparently almost circular, from four to five miles across, bounded by lower and higher hills, behind which a few higher peaks look down gray and solemn. This is El Cajon. We step out on the platform of the station, and the view is fine. The valley lies below us, the bottom is apparently flat, but in reality slightly undulating and somewhat sloping towards the center. Rows of vines begin at the station, and from here vineyards stretch in all directions for miles and miles, sometimes in large blocks of regular shape, then again in irregular patches among otherwise cultivated lands half way up on the lower hills. Dotted all over the valley are farmhouses in all styles, elegant and tasty or plain and simple, enough only to keep out the rain and the sun. Around every such cluster of buildings there is a little plantation of eucalyptus and cypress, and a few ornamental plants. Here and there at long intervals is seen a row of gums, black and somber, as if they were on duty as shields from wind and fog. We are soon in the bus on the way to town. The roads are straight and well kept, bordered with young eucalyptus and cypress, and with vineyards on both sides with the rows of vines remarkably distinct; we can follow each one of them distinctly for several miles over the undulating ground until they end on the steeper slopes of the hills, or run into the little cañons bordering the valley. El Cajon has no pretentions to being a town; it is an unassuming and quiet little village, whose inhabitants, when they speak of "town," always mean San Diego, twenty miles away. El Cajon has a dozen houses, all told, one of each kind of the most necessary stores and shops, but Wells, Fargo & Co. have not yet discovered this quiet place. Nevertheless, it has two hotels, one small and unassuming, which runs a bus to the station, and where everybody seems to meet; the other, large and pretentious, both as to bay-windows and name,—Corona del Cajon, but apparently void of much internal life. The railroad to El Cajon was finished only some eight months ago. If it had been running three years ago during the Southern boom, the valley would perhaps to-day be rivaling Pasadena and Riverside in thrifty farms and residences.

El Cajon is the most important raisin-producing district in San Diego county, and so exclusively and to such an extent have the raisin grapes been planted here that we hardly see anything else. Vineyards as far as we can see in all directions; vineyards in the rolling bottom of the valley; vineyards also on the steeper slopes of the hills; nothing else than Muscats of Alexandria for business, and only a few other vines around the cottages for home use. A drive through the valley brings us in close contact with what we saw from the more elevated station. One vineyard joins the other, with only a road between, and there are no rows of poplars and only very rarely a row of eucalyptus or cypress. The view is open on every side, and from every point we can see over the valley and the low hills surrounding it. The vines have at this time of the year left off growing and have assumed a dark green color, not relieved by any young and more vividly colored shoots. The grapes hang ripe under the branches, and the trays are in many places distributed in piles over the field. There are two packing-houses in the valley; the one now under way is 40 by 130 feet, being built of redwood, and apparently most carefully put up. I see no sign of irrigation anywhere, and every one tells me that it is not required. But I cannot help thinking that a little water judiciously used would have kept the vines growing much longer, and would have naturally increased the crop, which now only averages two and one-half tons of green grapes per acre. There are many very beautiful mansions in the valley, surrounded by very praiseworthy attempts at landscape gardening, but the absence of water for irrigation makes itself felt everywhere, both in regard to the size of the plants and their color. Water can be had in abundance at a depth of from only twelve to eighteen feet, and windmills and reservoirs would do much towards a substitute for ditches. As we drive through the valley and up the divide between El Cajon and the Sweetwater valley, the view is very attractive indeed,—on one side the many well-kept vineyards of El Cajon, on the other, way below us, the narrow and winding valley of the Sweetwater.

The Sweetwater valley, or rather continuation of valleys, is much smaller than El Cajon, perhaps only a quarter or half mile wide, but it is more favorable to raisins, grapes or vegetation of any kind. Olive orchards of good size trees, vineyards with large and yet growing vines, cornfields and pastures, and the winding and shaded little creek in the center of the valley, give the latter a freshness and beauty not surpassed anywhere.

On our way on the railroad as well as through El Cajon valley, we have frequently passed alongside of or under the now famous Cuyamaca flume, carrying water to San Diego and Coronado. This flume is a fine structure, running sometimes in the ground, sometimes again on elevated trestle-work over the ravines, or spanning the gaps between lofty hills. The whole length of the flume is thirty-six miles, and the cost of construction was $112,000. Its size is five feet, ten inches wide, and sixteen inches deep, but by an addition of two more boards the depth of the water can be increased to three feet, ten inches,—a large body of water for this country, where water is comparatively scarce. The flume heads in a magnificent dam at the head of San Diego river, and it would suffice to irrigate quite a large stretch of country if the people were only willing to use the water. But the farmers here have been so repeatedly told that the land absolutely needs no irrigation, and indeed would be ruined by the same, that the most of them now fully believe this to be the case. The water is therefore not diverted anywhere along the route of the flume, and even in El Cajon and other places, where the crop of almost every kind of fruit would be doubled by judicious irrigation, no effort to use the same is made. I could find no one who irrigated, and as a consequence the company that owns the flume have not yet put in the extra boards that would more than double the carrying capacity of the flume.

One of the most interesting places in San Diego county is the famous Sweetwater dam. It takes only two and one-half hours to visit it and return, and a trip to it will repay the trouble. We start out southeast and cross to National City, only a few miles from San Diego, and really a suburb of that town. National City is decidedly new, an attempt at something grand, which it will take sometime to finish. The most interesting thing there, in a horticultural sense, is the olive orchards of Kimball Brothers. They are scattered in two or three places, and comprise about fifty acres altogether. The trees are as large as good size apple trees, bushy and silvery, and are heavily laden with fruit. The land around each tree was checked up, each tree having a little square for itself, and a Chinaman with a hoe was busy irrigating. In one corner of the orchard was a large circular reservoir five or six feet high, and perhaps twenty feet across, to facilitate the irrigation. The train starts from here directly in among the hills, following the bed of the Sweetwater river. The bottom land is now being settled up by farmers and gardeners, who were busy taking their first lessons in irrigation. The plantations of course are very young, the irrigation works having been finished quite recently. At Sunnyside there are a few older orchards of oranges and olives, but, as a whole, the country is uncultivated.

Five minutes more and we are at the dam. There is no station, except a little wooden platform, and we had to scramble over a rough hill to get down to the dam. The gorge there is probably one hundred feet wide and several hundred feet deep, with almost perpendicular sides. There is no other vegetation visible than grass and a few low shrubs scattered around. It is a most excellent place for a dam. The Sweetwater dam is built almost entirely of masonry and cement, and, both as regards construction and size, is one of the very best in the world. It is built in the shape of an arch, with the convex part up stream, and gives an impression of solidity and safety not always found in structures of this kind. The masonry dam is forty-six feet wide at the bottom, at the top twelve feet. The length of the top is 340 feet, and at the bottom of the cañon the base of the dam is about one hundred feet, while the height is about ninety feet in the center. At one end of the dam is a wasteway and gates for letting the water out in case of a flood. The gates slide on an inclined plane, and consist simply of three-inch boards with pegs in each end, which are caught by a hook when they are to be raised. The capacity of the wasteway is said to be fifteen hundred cubic feet per second, or as much as the Sweetwater river is ever likely to carry, even during flood time. For one who is accustomed to headgates and waterways in the Fresno canals, this waterway looks very small indeed. But the engineers say it is large enough, and we suppose they must be right. The water is delivered through a large iron pipe thirty-six inches in diameter, covered for some distance down the cañon with masonry. For 29,807 feet, this pipe line runs down the valley or on the mesa lands adjoining it. It will deliver fifty million gallons of water per day, and can now irrigate ten thousand acres of land. The whole cost of construction was $502,000, and the time consumed in building was two years.

The reservoir, as it now stands, is a magnificent sheet of water with tributary watersheds of 186 square miles, and a water surface of about three and one-half square miles. It is a grand illustration of the enterprise of the San Diego capitalists, of the skill and success of the California engineers, and of what may possibly be accomplished on nearly every stream in San Diego county. It is a structure of which any country might be proud, and which has few equals and no superiors anywhere in the world.

On our way back we meet a picnic party of schoolgirls, who with their teachers have spent the day in the country. They fill the cars with smiles and chat, with flowers in boquets and garlands, in baskets and by the armful. We are treated to flowers and to beautiful Muscat grapes culled from the vineyards,—enormous bunches and berries almost as large as plums. These grapes are a revelation to me, grown here within the reach of the fogs of the ocean, and irrigated with water from the dam or flume. Verily, I have never seen choicer grapes anywhere, and I am satisfied that they could not be surpassed by any for raisins. What a fertile country this will be when irrigation is better understood and more practiced. Could we but see it when that time comes.

RIVERSIDE.

There is no place in Southern California where the effects of a close and intelligent study of horticultural matters are so visible as in Riverside. Money alone may build villas and mansions; but the intelligent and ever watchful horticulturist alone can, out of climate, soil, water and capital, produce a Riverside. It is charming beyond description; it must be seen to be realized. The best time to get a full and good view of Riverside is early in the morning, just at sunrise, and there is no better place to view it from than the hill on which the Hotel Rubidoux was to have been built. I arose before sunrise, and struggled up the steep hillside. It well repaid me for the trouble, as few more beautiful views can be had. The whole settlement can be taken in at a glance,—the town close by imbedded in orange groves and vineyards, and the dense verdure of the country stretching for ten miles down the valley, and almost connecting with the yet farther off South Riverside. On the eastern side we see the San Bernardino Mountains, with the "Old Greyback," and between the mountains and the settlements a lower range of steep hills appear, which in a continuous range either bar the way or like isolated islands shoot boldly up from the mesa land.

The Riverside colony forms a continuous settlement along the mesa, skirting the river, the deep green of the orange orchards harmonizing splendidly with the lighter green of the vineyards. At close intervals there are houses in every direction, with the bluest smoke rising straight up from their chimneys, and thence carried in long, tiny bands and columns down the valley just level with the tree tops. It is a pity the hotel on this hill was never finished — a great many more would then have enjoyed the almost unequaled view. An extension of the main business street in town leads up to this hill. On both sides of the street there are fine orange orchards and neat houses,—real country homes, sidewalks of cement where rows of fan-palms take the place of regular shade trees along their sides. The business portion of Riverside is confined to two streets crossing each other at right angles. If we stand in the center of this crossing we take it all in, the houses extending a block and a half in the four different directions. Some of the houses and brick blocks are very large and expensive, while many again are smaller, but all are costly and elegant, with new and perhaps startling ornamental designs. Whatever Southern California does, it does well, and even the cheapest structures have an air of character and taste which can hardly be too much admired.

When one speaks of Riverside he means the whole settlement that is irrigated, and to live in Riverside may mean to live in town, or it may mean a suburban residence ten miles away. In the latter locality the benefits of the country are happily combined with the luxuries of city life. Street cars run from the center of the business part of town down to the end of the settlement. It is a cheap way to view the settlement to board one of these early cars. You can see as much as any one may care to see, but of course cannot stop and examine. The whole drive is one not to be matched anywhere else. From the moment you leave town you pass orchards and vineyards separated from each other by only a road or cypress hedge. Every foot of ground is taken up. The main effort of all the settlers appears to be to make everything attractive, from the very sidewalk to the elaborate garden and the villa. Nearer town, every street has sidewalks of cement, and bordering them are continuous hedges of cypress trimmed in various styles, and in front of every house are lawns and plats of shrubbery and flowers, as neatly kept as if visitors were expected day or night. Some of the villas partake of the character of mansions, with towers, balconies and painted windows, while here and there in some of the finest orchards are yet seen some of the first houses built, small and unpretentious. The individual tastes of the owners are clearly discernible. One has a row of palms running along his sidewalk, another has palms and grevilleas, while others prefer the pepper and gum. The manner of trimming the hedges is charming; it has here become quite an art. Some hedges have square, others roofed tops, and at every corner there is a little pillar of cypress with diamond or globular top, not at all artificial or stiff.

The vast majority of the plantations consist of orange groves. The color of the trees is splendid, every leaf being bright and shining, and there is no sign of smut or scale. The large and upright Seedlings are easily distinguished from the smaller but bushy Navels. The tendency is now to plant mostly the latter, and most of the old Seedling trees are being budded over. The original Navel tree, which is the prime cause of the prosperity of Riverside and of the fame of its oranges, is yet standing by a modest cottage, which appears not to have kept pace with the times. The tree is small, perhaps twelve feet high, having been constantly cut back for buds. From this tree have sprung all the rest. No other Navel tree imported from Brazil or Australia resembles it in quality of fruit or in bearing capacity. It is probably a chance "sport" originally imported by the Agricultural Department at Washington, its companion trees being different in the most essential points which make this variety so valuable and so famous. This beautiful and choice orange, now generally known as the "Washington Navel," is slightly oblong or egg-shaped, and the skin is very smooth, with no ridges at the poles, the latter being characteristic of the other Navel varieties. The crop of Navels this year is good. Many growers expect from three to four boxes to the tree, and, as each box brings from three to four dollars, it is evident the business pays. The valuable and permanent improvements everywhere show this to be the case; the account books of the grower need not be searched to demonstrate it. Here and there we also see a lemon orchard with its larger trees of a different green. A few years ago many lemon orchards were dug up, as no one understood the secret of saving the lemons till the warm season, when alone they can bring a good price. But at last one of the growers wrung the secret from Nature, and now buys up all the young lemons he can find and stores them away to be used from six to ten months later, just when they are most in demand. In company with that courteous horticulturist, the editor of the Riverside *Press*, E. W. Holmes, we visited this gentleman, G. W. Garcelon. To him is due much credit for having discovered the process. He presented us with lemons of the small and proper size that had been picked green eight months ago. They were equal to the best imported, both as to smallness of size, acidity, thinness of skin and quality of juice. These lemons bring now five dollars per box, at which price lemon culture proves more profitable than that of the orange.

The only variety that should be planted is the Lisbon lemon, the Eureka having too bitter a peel, and the much recommended Villa Franca being round and thus unacceptable. We passed several vineyards, the Muscat vines being large and the vineyards well kept. The grapes are just ripening, but it will be some two weeks yet before they are ready to cut. The only variety grown here is the Muscat of Alexandria, the real Gordo Blanco being unknown, or at least not generally planted.

The far-famed Magnolia avenue is near at hand. The center is occupied by a continuous row of old pepper trees, with gracefully drooping branches, under which the cars run. The outside rows are different in various places, generally palms with alternating grevilleas, or gum or pepper trees. The custom now is to replace the outside trees with palms, and many of the stately gums are being cut away. Beyond the sidewalks are the trimmed cypress hedges, and behind them orange orchards, only interrupted by open lawns and gardens partially hiding the tasty dwelling-houses of the horticulturists. All that we see, now so luxuriant and beautiful, is the effect of water on the otherwise barren plains. Everything is irrigated several times a year by means of flowing water brought from distant points, from the mountain cañons, or from the artesian wells in the river bottom higher up, several miles away.

The canals are all on the highest ground, and are dug on technical principles. There is no washing and no filling up, no broken-down gates and overflowing and stagnant ponds. Some ditches are cemented, and look magnificently clean, without any weeds or mud. The water in them is like the water of a spring, clear and pellucid. In course of time all the ditches will be cemented, the cost for doing the work being paid for in a short time by the water saved and the absence of the necessary cleaning out.

Riverside is indeed to be envied its Chinatown. The latter was, some years ago, moved a mile from town into a hollow, and now every house there is surrounded by cypress hedges and windbreaks of cypress and gum. Moreover, every house there is connected with the sewerage system, and the usual smell is not noticed on the outside. Indeed, one can drive by and not know the nature of the town, for it looks like any other country village, almost hidden in evergreens.

In a few weeks the raisin harvest will commence, and from that time on Riverside, along its whole extent, will be life and bustle. When the grapes are all in, the oranges will be ready for harvesting, and the country will again boast of its thousands of carloads of the golden fruit.

REDLANDS.

We have reached the object of our journey in the upper end of the San Bernarnino valley. One of the features of South California, not Southern California, as we in the center all used to say, is the motor roads, not electric motors, but regular little steam engines, that will pull you anywhere, and which will not shock you with anything except perhaps with their smoke. Such motor roads lead almost everywhere, connecting the outlying colonies way up in the mesa with the headquarters on the regular railroad. And these motor roads are neither neglected, nor do they go begging for customers and freight. They are as much or more patronized even than the regular railroads, and they pay well. The cause of this is evident. They are more accommodating; they can without inconvenience stop wherever required, and passengers get on or off at almost every corner. The little train stops with equal readiness at the call in front of the rich man's villa, to enable him and his family to embark, as at the poor man's garden, to allow him to get on with a load of greens or with a basket of eggs. Thus managed, it rushes along with short and frequent stops, always full of passengers and freight.

Going up the San Bernardino valley from Riverside is a trip that no one should neglect. It takes us through one of the best improved parts of South California, through a veritable garden spot, with a radius of six or seven miles. From Riverside we pass for several miles over the level mesa land, just brought into cultivation through the new Gage canal system. Over two thousand acres have been planted here within the last two years to oranges, lemons and vines, and the fine and regularly planted trees with the large distances between show us how much the new settlers have been able to profit from the experience of the older ones. For several miles there are young plantations, each with its neat and substantial residence and outhouses, indicating that the settlers mostly are people of some means and of much refinement and taste,—just the class of people that we all would choose for our nearest neighbors. Everywhere are schoolhouses of artistic designs, most magnificent ones in the older settlements, smaller but tasty ones in those of almost yesterday. As we pass along the mesa, the upper San Bernardino valley, closed in by steep and lofty mountains, lies on our right, and in front the Santa Ana river courses through the center of the valley, with its vast broad river bottom covered with wild vegetation, pastures or cultivated fields. We cross several ditches, one laid in cement, with the water running in them as clear as that in the washbowl.

Once across the river bottom we are almost directly at Colton on the Southern Pacific Railroad. The first thing that attracts our attention is the beautiful plantation on the railroad reservation. Fine green lawns, fountains, beds of evergreens and flowers, the whole inclosed in pepper trees, gives the traveler immediately the impression that something beautiful in the way of gardening can be accomplished, where there is only a will and a taste. Such beautiful places everywhere in the South show that the people who came here, came not alone to make money, but also to enjoy life and to cultivate those pleasures and occupations which help to prolong and beautify the same.

From Colton up to San Bernardino the whole country is settled up and resembles the outskirts of a large city, where the business men have their suburban residences. The level and gradually sloping mesa is dotted over with little hills and knolls, just the place for a residence. Every such place has been taken advantage of, and fine residences with towers, balconies and airy awnings crown every little eminence, each one through its peculiar situation seemingly dominating the valley.

San Bernardino has been greatly benefited by the boom. The old and the new are there in strong contrast, the new decidedly predominating. Magnificent brick blocks grace the principal business streets, and the nearest streets crossing them, blocks that must have cost large sums of money, and which for design and substantial structure can nowhere be surpassed in any city of this size. The fine large hotels erected lately are kept up with style and even splendor. The large Stewart House is not inferior to the best town hotel that can be seen anywhere, and its interior arrangements, with a large covered court, are most admirable. My stay in San Bernardino was only too short; a long stroll around town and a little longer shake hands with the veteran journalist and horticulturist, L. M. Holt, took all the time I had to spare.

From San Bernardino to Redlands is but half an hour's ride through the bottom lands of the Santa Ana river. We approach rapidly the upper end of the valley, where the elevated mesa spreads out all around like a perfect ampitheater, backed by the loftiest mountains in Southern California. The mesa is now in close view, and Redlands, Lugonia, Terracina, Crafton, all different points of the same settlement, lie in front of us at an elevation of about fifteen hundred feet above the sea, like a map or extensive panorama, where roads, orchards and houses are so clearly and distinctly seen that they can be observed at a glance. The mesa land here slopes about four hundred feet to the mile, and the different orchards or settlements lie apparently one above the other, all in full view. If I am asked for the place in this part of the country with the finest view, with the freshest air, with the purest water, and with the coolest breezes, and where business and the comforts of life can be combined, I will say, and say it again, Redlands. In all these points there is nothing here that surpasses it, and few are the places indeed that even can pretend to equal it. From whatever point we stand, be it at the lower end of the railroad depot, at any orchard or home in the center of the settlement, or at the upper end close to the rolling hills, from every point we see every other point, some below, some above us, all equally distinct. And this extensive and magnificent view, that requires no tedious and tiresome climbing to see, extends away down the valley for sixty miles, over slightly rolling hills, over level mesas with their dark-green orchards and vineyards, over the steeper hills, over the lofty Sierra Madre range in the northwest. If we turn to the right we are immediately met by the snowy peaks and the bare walls of the San Bernardino range, here and there cut by the cañons and gorges of the tributaries of the Santa Ana river.

The business part of Redlands is as neat and tasty as any,—brick blocks and cement sidewalks, horse cars, and water under pressure.

No explanation is required to be made of the quality of the Redlands climate and soil. A trip over the settlement will reveal all to any one with open eyes. Orange orchards, young of course, but thrifty, on every side, alternating with Muscat vineyards, according to the taste of the owner; beautiful homes of the horticulturists, the stately mansions of the bank presidents and those that became wealthy quickly, and the grand view common to all,—these are some of the good things this settlement enjoys. The water for irrigation is all under pressure, either coming to the surface in open flues or in iron pipes. The orange orchards are being irrigated everywhere, in a way which should make a San Joaquin valley man stare. Iron pipes are laid all over the orchard, and at the beginning of every row of trees there is a faucet. These faucets are all opened at the same time, and a tiny stream of water issues forth and runs on each side of the young orange trees down to the other end of the check. It is left to run for several days at a time. At the other end of the check the water is not wasted, but runs into a little wooden spout at every row of trees and through the same into a cement ditch which carries the water to another place. The system of irrigation is simply perfect; if it were not so, the land could not be irrigated. With this system there is no waste, no weeds, no malaria, no hoeing nor other work of any kind. Irrigation is here as easy as the washing of your hands in a patent washstand: you open the faucet and let the water run. The general opinion by people not acquainted with the colony is that water here is very scarce; this is a mistake. There is water enough to irrigate all the land; most of it is now only running to waste to the sea; to be utilized it must only be stored. The Bear valley reservoir, when perfected, as it soon will be, will hold water enough to irrigate over twenty-six thousand acres of ground, which is about all the irrigable land tributary to Redlands. There are other reservoir sites in the mountains, and the possibilities of future irrigation can hardly be comprehended. Although young, only four years old, the upper San Bernardino colonies produce already considerable quantities of fruit. Six thousand acres are now under cultivation, eight hundred of which are in Muscat grapes, the balance mostly in oranges and other fruits. Last year they produced fifty carloads of grapes and forty carloads of raisins, and altogether about 149 carloads of fruit, dried or fresh. No better showing could be expected of any place, and there is no better advertisement of the resources of the country.

I have yet a thing to add, a thing to praise. Everywhere in the South magnificent drives are laid out, avenues are planted with shade trees, evergreens and palms, street cars take you everywhere, and the comforts of pedestrians and riders are always assured. The roads are all sprinkled, and the dust is an unknown quantity except in by-lanes and corners, where the sprinkler cannot reach. Riverside sprinkles the whole of her business streets, and her Magnolia avenue effectively and continually for about ten miles down the valley. Other places do the same, perhaps only not to as liberal an extent. In many places the tired pedestrian finds little wooden benches to rest on under a shady tree, close to a fountain of drinking water, all placed there by the kind society, W. C. T. U. Comparisons are not in place; but how many times I have wished such a thing had been met with in some other places I know of where the sun is just as hot, and where the dust is just as deep.

AN HOUR IN A PACKING-HOUSE.

The following sketch of a Fresno packing-house, where already cured raisins are bought and packed, may prove interesting to those of my readers who have not had time or opportunity to visit any similar establishment. The same kind of work is going on in each packing-house, whether it be large or small, except that the number of hands are varied. In the two or three largest packing-houses in Fresno, as many as four hundred hands are sometimes employed at one time when the work is pressing; as it slackens, less hands are used. These large city packing-houses are all situated close to the railroad; they buy the raisins already cured and dried from the colonists, who bring them in sweatboxes to town. The time of the greatest activity is from the last week in August to October 15th. The largest of these city packers are Messrs. Cook & Langley, who own packing-houses both in Riverside and Fresno; Shacht, Lemcke & Steiner, successors to George W. Meade, the oldest packing-house in Fresno, superintended by H. W. Shram; Chas. Leslie & Co., Griffin & Skelley, etc.

The pioneer packing company of Fresno, known as the Fresno Raisin & Fruit Packing Company, is doing at this time a large business. Every day five or six carloads of raisins are sent away, while a string of from twenty to thirty, two and four horse teams are waiting outside of the weighing shed to have their raisins weighed and received. These raisins come both from large and small vineyards from all over the country, but principally from the colonies, where they are the products of twenty-acre vineyards. Some of the best raisins in fact came from the smallest vineyards, where they had the best care, and where the owner has given the vineyard all his time. Mr. H. W. Shram, the superintendent of this large and old packing-house, has had years of experience in the packing business, and has followed the Fresno raisin business from its infancy. As soon as the raisin boxes are unloaded they are immediately weighed. It takes eight men to attend to this part of the business, one weighing and one clerk to keep accounts. The dried wine grapes, such as Zinfandel, Malagas, and even Sultanas, are immediately wheeled into the stemmer-house to be separated from the stems and cleaned. This stemmer is one of the largest in the State, and the only one of its kind as regards construction. It stems, cleans and assorts, in from three to four different grades, sixty tons of raisins a day. Nine men are working this machine, some feeding, others pushing wide but shallow boxes under the spouts, others again wheeling them away when full. The steam engine of ten horse-power and boiler are fired principally with separated stems, refuse raisins, and stones of peaches and apricots. The separated dried grapes are packed and shipped in eighty-pound sacks, and go in this way to the East, or even to Europe. Every day one or two carloads of these dried grapes are shipped. The Muscatel layers, however, go first to the sweating-room, before anything is done with them. This sweating-room is one hundred by fifty feet, and has the walls and floor filled around with one foot in thickness of sawdust, so as to prevent the outside air from entering. This sweating room is constantly filled with raisin boxes from floor to ceiling, and seldom contains less than forty tons of raisins at one time. It takes from ten to thirty days to equalize the moisture in the raisins as well as to properly soften the stems so that the grapes will not fall off. This is of the utmost importance. If it is not done the stems will break and the berries fall off, and instead of a first-class layer raisin we would only get a first-class loose.

After having sweated for several weeks the raisins are brought out to be assorted. We see several rows of oblong tables, each one with a border around like a deep and large tray, and with a hole at each end in which the loose raisins are pushed. It takes eighteen of these tables to receive the grapes to be assorted, and as it also takes six girls at each table, it is evident the work is one of great importance. Only girls are used, as boys and men could not as properly do the work. It takes a girl's nimble fingers to handle the raisins, so that none break. They are also more patient, and are, in every way, suited for the work. As the raisins are being assorted, the different grades are clipped from the same bunches, and placed in different trays. Thus one and the same bunch may contain four different grades of raisins. Each one is separated at these tables, to make different brands of raisins. The trays, with five pounds of raisins each as they leave the graders, are placed in large piles on the floor, and are from there taken away at leisure, first to be packed and afterwards to the press. This is a department of its own. It takes great experience to press the raisins just so much, that they will look well, but not so much as to burst. A broken raisin will sugar and spoil, and would cause complaint and dissatisfaction. The public is constantly being educated as to what fine raisins are, and now wants only the best. Each tray is pressed, and it takes four trays to make up a box of twenty pounds. A tray is placed over the box, the sliding bottom is pulled out, and the whole cake of raisins with paper and all drop in the box below.

After the raisins are assorted they have to be packed. Twenty girls are occupied with this, the most pleasant, but also the most skillful, work in the packing-house. No bad raisins go in here, and if any there should be, they are separated and placed with a lower grade, as even one or two raisins would spoil an otherwise good box. This requires a great deal of care and attention, but the girls are being educated, and the same ones are re-engaged from year to year. Fresno is getting an army of girls educated for the business, and we find much less trouble now to get the raisins well packed than a few years ago, when everything was comparatively new. Now there is hardly a girl in any of the colonies who does not know something about raisin-packing, and who is able to make good wages during packing time. Several cents a tray are paid for packing, and many girls earn two dollars a day, while none earn less than one dollar a day. The first quality raisins are packed under the Lion Brand, while the second quality goes by the name of the Golden Gate. Both brands are equally popular and are readily sold. The loose raisins are as important as the bunches and layers. The American housewife has learned that she gets more for her money if she buys loose raisins than if she buys layers, which always contain a large percentage of stems. Loose raisins are therefore now very popular. The loose raisins have all been sweated, and the best of them have come from large, fine bunches, from which they have simply dropped off, and magnificent they look indeed as they are separated and graded into several grades, the largest of course to make the very choicest brands. The process of packing is quite different from that of packing layers. In loose, the boxes are simply filled with fifteen pounds of loose raisins; then a tray containing five pounds, and which has been faced, is placed on top, this making up twenty-pound boxes.

The facing is a most important and interesting work. It takes from forty to fifty girls to do it, and only expert hands are allowed at the facing tables. The facing consists in placing large, fine and flatted raisins in layers on top of the box, as an advertisement that the contents underneath are equally carefully assorted and choice. A careful and skillful facer can face forty boxes a day, while from twenty to thirty boxes is a low average. Mr. Shram buys raisins and dried grapes from every one who has any that are really choice. For Feherzagos three to three and one-half cents are paid, for Malagas four cents, and for Muscatels three and one-half to five cents, according to quality. All the work in the packing-house is done by piece work, and from two to five cents are paid for different qualities of the work, such as assorting, picking over, picking and facing. Four hundred girls and boys are daily employed. The present raisin pack, Mr. Shram affirms, is the best of any he has ever handled. They are shipped to every large town in the East, and are constantly increasing in demand. Besides raisins, Mr. Shram handles peaches, figs, apricots, and in fact any dried fruit we have. Tons and tons of Adriatic figs are brought from the colonies every day at six cents per pound, an enormous price when we consider the yield of a fig tree. But, says Mr. Shram, they are in demand, and as long as we can sell them again when packed and sweated to advantage we can afford to pay a good price.

When sufficient boxes are packed, they are loaded in cars and made up into trains exclusively loaded with raisins. The various packing-houses combine to do this. Generally during the packing season two such train-loads are sent away every week, each one consisting of from ten to fifteen cars of raisins, each car containing one thousand boxes. Five hundred and thirty such cars were shipped from Fresno last year (1889). Some of the packers packed one hundred thousand boxes each.

RAISIN GROWERS AND THEIR VINEYARDS.

The following sketches are intended to convey to those not living in the raisin districts of our State an idea of the men who have made a specialty of the raisin industry,—men through whose experiences and intelligent work others are now profiting.

While the raisin growers and packers can now be counted by the hundred, and while all of them have in some way contributed to the development of the industry, and as such deserve to be mentioned in the annals of this industry, it has only been practicable to here refer to a few of the most prominent. Where exactly to draw the line was not easy to decide, and my intention has been not to slight or neglect any one, and should any one find himself omitted he should account for it through my ignorance of real facts. I should especially have wished to add to these short notes more extensive accounts of the work and vineyards of R. B. Blowers of Woodland, of the late G. G. Briggs of Davisville, and of Robert McPherson of McPherson, but I have not been able to procure the necessary data. These three gentlemen have all greatly contributed to the development of the high standing of the raisin industry in this State.

G. G. BRIGGS.

Mr. Briggs was the first large raisin-grower in the State, and owned vineyards in both Solano and Yolo counties aggregating seven hundred acres or more. Subirrigation by means of perforated pipes, in which the water was made to circulate under pressure, was first tried extensively in Mr. Briggs' vineyard at Davisville, by which means the grape crop was almost doubled. Later on Mr. Briggs planted extensively in the Washington Colony at Fresno, but he died before his vineyard there came into bearing. He is said to have imported raisin grapes direct from Spain, and a grape now growing in the vineyard of G. E. Freeman at Fresno is said to be of that variety. It resembles the Muscat of Alexandria in growth, but the berries are those of the Gordo Blanco. Mr. Briggs advised to give the raisin-vines more room, and following his ideas several vineyards as well as his own were planted with the vines ten by sixteen feet.

R. B. BLOWERS.

R. B. Blowers of Woodland, Yolo county, planted his first vines in 1863, and produced his first raisins in 1867. From 1870 to 1873 he planted the principal part of his vineyard. He was the first one in California to do any really careful packing, and he may justly be said to be the father of the raisin industry in this State. Mr. Blowers was the first to irrigate the raisin-vines by means of pumping and flooding, for which purpose he constructed his afterwards so famous well. The first successful raisin dryer was invented and built by him at a time when every one else doubted the propriety and desirability of drying grapes by artificial heat, and the dryer thus constructed has never yet been surpassed. One of the characteristics of the Blowers dryer was the blower or suction fan, by which means the air was changed in the dryer, the moist air being sucked out, while dry air was allowed to rush in. Mr. Blowers improved nearly every branch of the raisin industry, and studied every operation, such as plowing, irrigation, curing and packing, more thoroughly than any one ever did before or has done after him. Mr. Blowers' raisins were the best in the State at their time, and wherever exhibited received the first premium. At the World's Fair at Philadelphia, they received the first premium, and attracted much attention. I may add that Mr. Blowers is the inventor or at least the perfector of the "face-down" method of packing, the best method for packing raisins. Mr. Blowers has published a short essay on raisins, referred to elsewhere in this book.

ROBERT McPHERSON.

Robert McPherson was for Southern California what G. G. Briggs and R. B. Blowers were for the Northern part. The McPherson vineyard extended once over 360 acres of land, and one year he shipped over one hundred thousand boxes. Many of the practical devices for irrigating, curing and packing raisins now generally in use in the southern part of the State were invented by him. The McPherson vineyard was situated in Orange county in the southern part of this State. Robert McPherson was certainly the largest and most prominent raisin-grower in Southern California. He is now no longer in the business.

T. C. WHITE.

The "Raisina" vineyard was the first thoroughly conducted raisin vineyard in Fresno. It was planted by T. C. White in 1876, '77 and '78, and from that time gradually extended until it contained one hundred and twenty acres, of which sixty-five acres are in Muscatel grapes of the variety known as Gordo Blanco, brought there from the Blowers vineyard at Woodland. The vineyard also contains some Seedless Sultanas and White Corinths. The soil of the vineyard is white ash, the location two miles south of Fresno, in the old Central California Colony. The soil is now partly subirrigated. T. C. White has done a great deal to develop and perfect the packing and curing of raisins, and he has also given much time and study to the other branches of the industry, such as growing, pruning and cultivation. Through the study of the imported Spanish raisins, as well as of those produced by R. B. Blowers, Mr. White succeeded in packing a very superior brand, which has never been surpassed in this State. The brands packed at the Raisina vineyard were as follows: Dehesa Clusters, London Layers, California Layers, Loose Muscatels, and cartoons of two and one-half pounds. The largest pack at one time was thirteen thousand boxes of twenty pounds each. In order to "face" the boxes accurately and rapidly, T. C. White invented the facing-plate elsewhere described in this book. Experiencing considerable difficulty in properly facing his

Dehesas, it occurred to him that a block or plate might be made with cavities in which the raisins could be placed quickly and without danger of being disturbed. His idea was entirely original, and the facing device as made by him is a perfect machine which has not been improved upon. This device is now covered by patents.

In packing T. C. White employed the Blowers' method, or the "face-down" method, which he so improved upon that it has not since been excelled. Many of the fine points in raisin curing and packing were perfected by him, and the raisin industry will always be benefited by the work he has done. Below I give a list of the premiums taken by T. C. White's raisins at various fairs: 1885, silver medal and special first premium for best raisins at Mechanics' Fair in San Francisco; 1886, first premium and gold medal at the Mechanics' Fair in San Francisco; 1888, first premium and one hundred dollars for best raisins at the State Fair. Same year they received first premium and gold medal at the Fresno District Fair; 1889, first premium at the Fresno District Fair.

MISS M. F. AUSTIN.

The story of Miss M. F. Austin and her success with the Hedge Row Vineyard reads like a beautiful tale. A schoolteacher by occupation, Miss Austin possessed many prominent qualities and elevated ideas, among others that horticulture should become a business for women as well as for men. Acting upon these ideas, Miss Austin removed to Fresno in 1878 in company with a lady friend and teacher, Miss L. H. Hatch, and she began immediately to improve her Hedge Row Vineyard, a part of which had been planted two years before by Bernhard Marks, the founder of the Central California Colony. The vineyard was gradually extended until it contained one hundred acres, nearly all in Gordo Blanco vines. Miss Austin must be given credit for having improved upon many operations in the vineyard and in the packing-house. She first discovered that under proper conditions the sulphuring should be done in the flowers of the grapevines. By this method she one year largely increased her crop of grapes. In packing she showed her womanly taste and refinement, and not only succeeded in producing superior Layer and Dehesa raisins, but made several innovations in packing which to this day are imitated. Among these we may mention the packing in cartoons, and in small ornamented paper bags, which latter were again placed in paper boxes. Miss Austin and T. C. White were the originators of fancy packing in this State.

The largest pack of the Hedge Row Vineyard was seventy-five hundred boxes, while the total of one year's pack reached sixteen thousand boxes. Miss Austin built the first raisin dryer in Fresno, and demonstrated that machine-dried raisins were a success if not a necessity as regards the last crop. The pluck and intelligence of Miss Austin soon became extensively known, and many were the ladies who, imitating her, engaged in horticulture and in the raisin industry. Fresno county and the State at large owe her a debt of gratitude for what she has done. Those who had the pleasure and honor of her friendship lost in her a dear and faithful friend, a brilliant and intelligent companion, and a person who had few equals in any path of life.

JOSEPH T. GOODMAN.

The owner of the Floreal vineyard arrived in Fresno in 1879, and purchased a then already started plantation, which, however, he soon greatly remodeled, enlarged and improved. Mr. Goodman, formerly one of the brilliant newspaper men and literary writers of this coast, and publisher of the *Territorial Enterprise* of Virginia City, Nevada, has probably more than any other man studied the characteristics and requirements of the raisin grapes. His vineyard, while not the largest, is in our opinion the best cared for in the State, and newcomers could perhaps not do better than learn from it. It now comprises one hundred and twenty acres, mostly in Gordo Blanco. For the curing of the grapes, thirty thousand trays or more are needed, while a separate packing-house and tray-shed are prominent features of the vineyard. The land was all leveled with great care before planting, and every check can be flooded if necessary. The soil is the very richest, being the chocolate-colored loam, which in Fresno is considered the best and strongest soil for Muscat grapes. The location of the vineyard is the old sink of Red Bank creek, in the same district where Forsyth's and Butler's vineyards are situated. As regards planting, pruning, sulphuring, topping and other vineyard operations, Mr. J. T. Goodman is an authority from whose verdict there is no appeal. The Floreal vineyard always bears good crops, which must be exclusively attributed to the care given the vineyard and to the judgment with which all operations there are conducted. Mr. Goodman has invented several appliances for facilitating the vineyard work, most prominent among which I may mention the vineyard truck, by the means of which the expenses of harvesting and some other vineyard labors are greatly reduced. He also suggested the facing-plate independently of T. C. White.

A. B. BUTLER.

The largest raisin vineyard in Fresno county or in the State of California, as well as in the world, is owned by A. B. Butler. The vineyard is situated about three miles southeast of Fresno, on the sink of Red Bank. It contains about six hundred acres, nearly all of which is planted in Muscat grapes of the Gordo Blanco and Alexandria varieties, and a few Sultanas. The vines are planted at various distances, such as ten by sixteen feet, and six by twelve feet, etc. The pruning is all "low standard," except the Sultanas, which are staked four feet high. The only trees in the vineyard consist of two or three avenues of fig and poplar interspersed with fan palms, while some poplar trees line the outside boundaries of the vineyard. The first vines were set in 1879, and since that time the planting has been carried on until the whole six hundred acres are now in vines in full bearing. Mr. Butler himself superintends the general work of the vineyard, and during the packing time carefully watches the packing. The latter is accomplished in a large building containing packing-rooms, storerooms, steam dryer, separator, box factory and storeroom for labels. The dryer has a capacity of fifty tons charge of green fruit, and is considered one of the best in the State. There are two dryers, the large one just mentioned and one smaller, of twenty-five tons capacity, situated in the center of the vineyard. The Butler raisins are celebrated all over the continent, and are most excellently packed. The labels used are very fine and are manufactured to order in France. The principal brand packed is "Butler's Cluster Raisins."

Mr. Butler acquired much experience in Spain, where he spent considerable time studying the raisin business. The output of the vineyard has been as high as one hundred thousand boxes per year. Similar to the other vineyards in this district, the soil of the Butler vineyard is among the very best in the county, all now subirrigated. Mr. Butler is the largest packer in the State, and his raisins have gained a continental reputation. As regards Spanish methods of packing, Mr. Butler is better posted than any other packer in the State. An interesting essay on Mr. Butler's experiences in California and in Spain is published in monthly *California* for March, 1890. The crop this year promises to be of extra quality.

WILLIAM FORSYTH.

The owner of the Forsyth vineyard and the producer of one of the two finest brands of raisins in this State arrived in Fresno in 1881, and planted his present vineyard of one hundred and sixty acres in 1882 and 1883. The vineyard is situated in the sink of Red Bank creek, some four miles east of Fresno, and consists of heavy reddish or chocolate-colored soil of unusual richness. The vines used are almost entirely the Gordo Blanco variety, with a few Sultanas. The land is all leveled, was irrigated the first year only, and is now subirrigated and drained, requiring no further irrigation of any kind. The vines, set eight by eight feet, are pruned low, and given short spurs. The outbuildings consist of a packing-house, and equalizing or sweating house combined, thirty-five by one hundred and seventy feet. A dryer of late pattern, with steam boilers and flues, has a capacity of forty tons at a charge. The houses for the laboring men as well as the Colonel's dwelling-house are most elegant and complete, and show the care and refined taste of the owner. Over fifty thousand trays for drying the raisins are used in curing, the trays being three feet square, large enough to hold thirty pounds of grapes. The grove of palms, ornamental and shade trees, the flowers and shrubbery surrounding the Colonel's home in the center of the vineyard, are all models of beauty and testify to the culture and prosperity of one of our foremost raisin-growers.

The vineyard produces yearly from fifty to sixty thousand boxes of twenty pounds each, of the highest quality of raisins. The raisins are remarkable for their high grade and even packing. The brands are: Forsyth's Imperial Clusters, the "Tiger" brand and the "Forget-me-not" brand. During the packing and picking season some two hundred and fifty hands are employed daily in the various departments, all under the direct supervision of Colonel Forsyth himself, who has gained his experience both by practical work in California and by visits to the raisin districts of Spain. During the latter he has gained much experience about foreign methods, which he has not been slow to apply in his own business. As regards location, the Forsyth vineyard is not surpassed by any, and as regards appointments it is the most complete and handsome establishment that can be found anywhere. The Forsyth raisins excel in quality of berry, grade, uniformity of size and in the elegance and care with which they are packed. They stand at the head of the California raisin product. Col. Forsyth has been appointed Commissioner for California at the World Fair in Chicago, 1892.

A. D. BARLING.

Among our younger raisin-growers and packers, Mr. A. D. Barling occupies a prominent place. A sketch of his life and connection with the raisin industry is most interesting. He came to the raisin district with only a dollar in his pocket. To-day he is a wealthy grower and packer, whose raisin brand is among the best in the State.

Mr. Barling, formerly of Michigan, was educated at Ann Arbor. In 1873 he left college and started West, settling in Merced county, California. There he became connected with the Farmers' Canal Co., as their chief engineer, which position he held for seven years, and in that capacity conducted the water of the Merced river down to Livingston on the S. P. R. R. From Merced he went to Mexico in the employ of the Mexican Central Railroad, but returned to San Francisco, California, in 1882. Here he had charge of the construction of the large wharf at Alameda point, then being constructed by the S. P. R. R. Co.

Becoming tired of working for a salary, Mr. Barling went to Fresno and rented a lot in the Central Colony. By dint of hard work, not having any capital at all to start with, he and his wife saved one thousand dollars, with which they purchased the present El Modelo vineyard, paying forty-five dollars per acre for the rough land in 1885. Mr. Barling and his wife went to work with a will and set out the land in Muscat cuttings, but through unfortunate and unforseen circumstances all the first planting was lost. Undaunted they replanted in 1886 with great success, and to-day they own one of the finest and best-paying 150-acre vineyards in the county, having yearly added new territory to the first purchase. Last season they packed sixteen thousand boxes of Muscat raisins, and established the El Modelo brand, which in the market is considered second to none, and which has established an enviable reputation for its packers. This year's pack is estimated to reach fifty thousand boxes of twenty pounds each. Mr. Barling's thorough education and skill and experience as an engineer has materially contributed to his success. He has also held the position of assistant cashier in the Fresno Loan & Savings Bank for the last five years.

FRANK H. BALL.

The Ball Vineyard adjoins the town of Fresno, and is situated in the rich red lands, the sink of old creeks. The one hundred and twenty acres in Muscatels are among the best cared for in the district. Mr. Ball possesses the faculty of doing the necessary work at the right time and doing it thoroughly. The crop is annually sold in the sweat-boxes to packers in Fresno City, no raisins being packed on the vineyard. Mr. Ball is the author of an excellent essay on raisin-grape growing and curing, published in the *California* for July, 1890. His methods of culture and curing are the best, and the raisins produced by them are not surpassed by any in the State. Mr. Ball is one of our most successful raisin-men.

SAN JOAQUIN VALLEY RAISIN PACKERS, 1889.

NAME.	LOCATION.	BRANDS.	LOCAL AGENTS AND ADDRESSES.	EASTERN AGENTS AND ADDRESSES.
American Raisin Co.	Fresno	Eagle, Star	Noble Bros., Fresno	Delafield, McGovern & Co., Chicago.
Barling, A. D.	Fresno	El Modelo, Golden Gate.	Townsend, McGovern & Co., San Francisco	Delafield, McGovern & Co., Chicago, New York and St. Louis.
Barton Estate Co.	Fresno	Peacock.		
Butler, A. B.	Fresno	Butler's Cluster	H. M. Newhall & Co., S. F.	J. K. Armsby Co., Chicago, etc.
Cal. Raisin and Fruit Co.	Fresno	Seal, Eclipse	Williams, Brown & Co., S. F.	C. M. Webber & Co., Chicago.
Camp, G. W.	Armona.			
Cook & Langley	Fresno	Horseshoe, Lily, Eureka.	Cook & Langley, Los Angeles.	Ariel Meinrath, Kansas Cy. & Chicago
Cook, H. E.	Fresno	Cook's	S. L. Jones & Co., S. F.	
Curtis Fruit Co.	Oleander.	Greyhound, San Joaquin.	H. M. Newhall & Co., S. F.	J. K. Armsby Co., Chicago, etc.
Forsyth, William	Fresno	Imperial, Tiger, Forget-me-not	Townsend, McGovern & Co., San Francisco	Delafield, McGovern & Co., Chicago, New York and St. Louis.
Fowler Fruit and Raisin Packing Co.	Fowler	Pride of Cal., Comet.	Brown & May, Fresno	
Fresno Fruit & Raisin Co.	Fresno	Lion, Golden Gate	Schact, Lemcke & Steiner, S. F.	Rossiter & Skidmore, New York.
Fresno Raisin Co.	Oleander.	American Flag	Brown, May & Co., Fresno.	
Gould, E. H.	Malaga	Olivet, El Monte	D. L. Beck & Son, S. F.	U. H. Dudley & Co., New York.
Griffin & Skelley	Fresno	Griffin & Skelley's	Griffin & Skelley, S. F.	Delafield, McGovern & Co., New York
Holton, S. B.	Selma	Golden West	Townsend, McGovern & Co., San Francisco	Delafield, McGovern & Co., Chicago, New York and St. Louis.
Leslie, Chas	Fresno	Liberty, Royal	Geo. & John H. Leslie, Fresno.	Geo. & John H. Leslie, Chicago.
Miller, James	Fresno.			
Mau, Sadler & Co.	Fresno	Sierra Park, Parrot.		
Paige & Morton	Tulare	P. & M., Brown & Co.	Paige & Morton, S. F.	
Reese, J. W.	Fresno	Cartoons.		
Rodda & Nobmann	Fowler	Maple Park	Townsend, McGovern & Co., San Francisco	Delafield, McGovern & Co., Chicago, New York and St. Louis.
Viau, N	Malaga	Viau's.		
Viau, S. P.	Malaga.			

LITERATURE.

The literature of the raisin industry is a very scant one, and as far as I have been able to ascertain not a single work especially devoted to this industry has appeared in any language. The various cyclopedias contain articles on raisins, but they are all more or less confused and unreliable, and of no great use to any one who wishes only reliable information, and who must depend upon the same for practical purposes. As regards California, much information has been given about raisin growing and curing in almost every newspaper published in the State. To mention them all would be to enumerate all the papers of the Pacific Coast. I can here refer only to a few of the principal ones, where the student who has time and inclination to follow up the subject may find material for a more detailed history of the raisin industry than the one I have written.

First among these papers I must mention the *Pacific Rural Press*, edited by that distinguished horticulturist, Professor E. J. Wickson, and published by Messrs. Dewey & Co. of San Francisco. In the files of this weekly, from 1873 to the present time, 1890, may be found scattered many interesting articles referring to our subject. A paper contemporaneous with it was the San Francisco *Merchant*, which contained many interesting articles on raisins and raisin grapes, especially during the period from 1881 to 1887. In the issues of the *Press and Horticulturist* of Riverside, San Bernardino county, California, we find during a series of years occasional notes and articles referring to the raisin industry of that section of the country. As regards the Santa Ana and Orange county district, the Anaheim *Gazette* will prove the most reliable guide, as recording the rise and decline, and, as we believe, also the revival, of the raisin industry of that section. The Yolo *Democrat* and the Woodland *Mail* published at Woodland, Yolo county, have devoted much space to the raisin industry of that section. In Fresno county the Fresno *Republican*, between the years 1882 and 1887, contained weekly a separate department for viticulture and horticulture edited by the author of this book, and that paper has ever afterwards devoted much space to recording the progress of the raisin industry of the country. The Fresno *Expositor*, the oldest paper in Fresno county, has contained much information about raisin grapes and vineyards since 1873, when the first raisin-vines were planted in the county. During the period from 1888 to 1890, this paper contained almost daily editorials upon the raisin industry, mostly contributed by this author.

The California *Fruit Grower*, a weekly horticultural paper mentioned below, has since its beginning a few years ago made dried fruit its specialty, and has contained many important articles on our industry, and in its columns may be found the most reliable raisin statistics published in this State. The San Francisco *Examiner* contained in 1888 a series of articles on raisins, contributed by this author. The San Francisco

Chronicle has from time to time given much space to the raisin industry, and its horticultural editor, George F. Weeks, has most ably contributed to the dissemination of knowledge about our California raisins. A special raisin edition of this paper appeared February 2, 1890. Another San Francisco paper, the *Journal of Commerce*, contains much information as regards raisin statistics and the progress of the raisin industry generally, and its files may be consulted with much interest and profit. Among Eastern journals I wish only to call attention to the *Fruit Trade Journal* published at New York up to date (June, 1890); it contains weekly statistics of raisin sales, etc., all of great interest to the grower and packer. An important contribution to the history of the raisin industry is the work by Professor E. J. Wickson,—"California Fruits, and How to Grow Them." It contains several chapters on grapes, most conscientiously written and very reliable. This book will always remain as a standard work of reference upon the subject. Professor E. W. Hilgard has during a number of years published essays upon topics related to our industry, all most valuable to the practical grower. They are enumerated below.

I may also mention the *Rural Californian*, published in Los Angeles. It devotes from time to time some space to the raisin industry of the southern part of the State. In the Reports of the State Board of Horticultural Commissioners will be found several papers upon the raisin industry, all mentioned below. Similarly the Reports of the State Board of Viticultural Commissioners contain several important and very interesting essays on raisins, etc., which are duly mentioned below. In these reports we find articles by T. C. White and W. B. West and others, as well as interesting discussions by growers. The *California*, a journal of rural industry, which commenced publication this year (1890), and is issued weekly and monthly, makes the raisin industry a specialty. It has already contained many articles contributed by our most successful growers, such as A. D. Barling, T. C. White, A. B. Butler, Frank Ball, Wm. Forsyth, etc., and also by this author. In the way of illustrations, California is fortunate to possess a most exquisite work on grapes. We refer to the very fine colored prints of California grape varieties published by Edward Bosqui. Among the number are our Muscat of Alexandria and Seedless Sultana. Each one of these plates is a work of art, than which there is nothing superior produced anywhere.

Below follows an enumeration of books, which to a greater or less degree refer to the raisin industry. For access to many of them I am indebted to the kindness of the proprietor of the Sutro Library, Mr. Adolph Sutro, of San Francisco, and to his librarian, Mr. George Moss.

ANSTED, D. T.: Ionian Islands in 1863. London, 1863.

ARQUIMBAU, JOHN D., United States Consul at Denia: Raisins in Denia. United States Consular Reports, No. 41½, pages 681 and 682. 1884. Mr. Arquimbau is the largest packer in Valencia.

AUDIBERT, JOSEPH: Les Raisin Sec. Paris, 1884. This work treats almost exclusively of dried grapes imported from Turkey and Greece to France for wine-making.

BALL, FRANK H.: My Work in the Raisin Vineyard. MS. to be published in *California* for July, 1890.

BARLING, A. D.: Culture and Curing. In Vol. I, No. 4, of monthly *California*, a Journal of Rural Industry, El Verano, Cal.; also in same weekly No. 14, April 12, 1890.

BEAUJOUR, F.: Tableau du Commerce de la Grèce. Paris, 1880.

BLOWERS, R. B.: Report on Raisin-making in California. First Annual Report of the State Board of Viticultural Commissioners. San Francisco, 1881. Pages 13 to 15.

BORDE, ANDREW: Breviary of Health. 1542.

BULLETIN, THE SAN FRANCISCO: Published by Messrs. Pickering and Fitch, San Francisco. The Bulletin was the first of the large San

Francisco papers to devote time and space to the horticultural and viticultural interests of California, and its weekly issues between 1875 and 1890 have been full of valuable information upon these subjects.

CALIFORNIA, a Journal of Rural Industry: Published by The California Company, San Francisco. Gustav Eisen, Horticultural Editor. Contained a series of articles on Raisins, by the author, commencing January, 1890, to date (June, 1890).

CHAMPIN, AIMÉ: Vine Grafting. Translated by J. H. Wheeler, in Second Annual Report of the Chief Executive Viticultural Officer to the Board of State Viticultural Commissioners for the year 1882-83, Appendix III. Sacramento, 1883.

CHIPMAN, GEN. N. P.: Report Upon the Fruit Industry of California. Published by the Board of Trade. San Francisco, 1889.

CHRONICLE, THE SAN FRANCISCO: Published by M. H. deYoung, San Francisco. This large daily paper contains in the weekly and Sunday issues much valuable information about horticultural subjects. The issue of Feb. 2, 1890, was especially devoted to the raisin industry, and was most ably edited by George F. Weeks, its horticultural editor.

COLMET: Dictionary of the Bible. 1838. Grapes of Eschol, seedless.

CORYAT, THOMAS: Crudities. London, 1776.

DAVY, JOHN: Notes and Observations on the Ionian Islands and Malta. London, 1842.

DIRECTORY OF THE GRAPE-GROWERS AND WINE-MAKERS OF CALIFORNIA; compiled by the State Board of Viticultural Commissioners of California. Sacramento, 1888.

DODOENS, RAMBERT (Dodonaeus Rembertus): Histoire des Plantes. Antwerp, 1557.

DOWLEN, E.: Several Reports on the Mysterious Vine Disease to the State Board of Viticultural Commissioners of Cal.; published in the San Francisco *Merchant and Viticulturist* during 1889-90. These reports of carefully conducted experiments are highly interesting.

EISEN, GUSTAV: Raisin-grape Growing. A series of articles on the Growing, Curing and Packing of Raisin Grapes. Published in the San Francisco *Examiner*, both in the daily and weekly, during the months of September and October, 1888; also a series of articles on Raisins, in *California* for 1890.

ENGLISH SOURCES: Under this heading I have referred to a pamphlet on Dried Fruits, by an unknown English author, privately printed and circulated. The part pertaining to raisins is very detailed and contains much information of which I have made free use in this book. It was kindly placed at my disposal by Mr. Thomas Nelmes, of Pasadena. The book being without title and the author unknown, I cannot refer to it in any other way. The pamphlet appears to have been printed in 1876.

EXAMINER, THE SAN FRANCISCO: Published by W. R. Hearst, San Francisco. Contained during the months of Sept. and Oct., 1888, a series of articles upon Raisin-grape Growing by the author of this book. In March, 1890, appeared a special Fresno number, with much information about the raisin industry (author unknown).

FARLOW, W. G.: On the American Grapevine Mildew. Bulletin of the Bussey Institution, March, 1876. Boston, Mass.

GALLOWAY, B. T.: The Journal of Mycology. Published by the U. S. Department of Agriculture, Washington. Several volumes published in serial to date, 1890. Contains articles on Grape Fungi, etc.

GRASSET DE SAINT SAUVEUR, JACQUE: Voyage dans les Iles et Possessions des Venetiennes. Paris, 1800.

GROCER AND COUNTRY MERCHANT, THE SAN FRANCISCO: Published by Briggs and Harrington, San Francisco. Devotes much attention to raisins, as well as to other rural industries of California.

HACKLUYT, RICHARD, REV.: Principal Navigations, Voyages and Discoveries made by the English Nation. London, 1589.

HARKNESS, H. W.: Fungi on the Pacific Coast. Bulletin of the California Academy of Sciences. Vol. II, 1886 to 1887. San Francisco, 1887.

HARTEMA, LUDOVICUS DE: In Hakluyt. Principal Navigations, Soc. ed., p. 77. Mentions seedless raisins from the Town of Reame in Arabia Felix.

HEAP, G. H., United States Consul-General at Constantinople: Fruit Culture in Turkey. United States Consular Reports, No. 41½, pages 726 to 740. 1884.

HILGARD, E. W.: Alkali Lands, Irrigation and Drainage, etc. University of California, College of Agriculture, Appendix VII, Report for the year 1886. Sacramento, 1886.

——— Investigation of California Soils. Appendix I, Report of the Professor in Charge, etc. University of California, College of Agriculture. Sacramento, 1882.

——— The Rise of Alkali in the San Joaquin Valley. University of California, Agricultural Experimental Station, Berkeley, Cal. Bulletin No. 83.

——— Abnormal Deposits on Vine Leaves. In *same*. Bulletin No. 70.

——— Mysterious Death of Vines. *Same*. Bulletin No. 70.

——— Sulphuring of Vines. *Same*. Bulletin No. 56.

——— Irrigation, Drainage and Alkali. Bulletin No. 53.

——— Examination of Tule, Marsh and Alkali Lands. Bulletin No. 28.

LE BRUN (or BRUYN) CORNEILLE: Voyage au Levant, Delft, 1700. Mentions seedless raisins in Persia.

LITHGOW, WILLIAM: Adventures and Peregrinations. 1614.

LOCKE, JOHN: Histoire de la Navigation. Paris, 1722.

MARSTON, H. C., United States Consul at Malaga: Fruit Culture in Malaga. United States Consular Reports, No. 41½, pages 682 to 689. 1884.

——— Malaga Raisins. United States Consular Reports, No. 10. Republished in said Reports, No. 41½, pages 691 to 693. 1884.

MAS ET PULLAT: Le Vignoble. Paris, 1876-77. On page 73, tome 1, we find a figure of a Muscat of Alexandria with round berries, and which undoubtedly is nearly related to the Gordo Blanco. It is not the true Muscat of Alexandria. As synonyms are given Gordo Blanco and (Don Simon Roxas is referred to as authority) also Uva Zibeba. The latter is undoubted the same as our Muscat of Alexandria. Another synonym is Muscatel Romano, which again is only another name for Gordo Blanco. The French authors have undoubtedly everywhere confounded the two varieties. In the same work, page 31, tome 1, we also find the White Corinth referred to as the currant grape of Zante, which is erroneous.

MORYSON, FYNES: Itinerary, containing Twelve Years' Travels through Turkey, France, etc. 1617.

NIEBUHR, CARSTENS: Description de l'Arabie (Trans. from German). Copenhague, 1773. Mentions "Kishmish" seedless raisins from Arabia.

NOVEAU DUHAMEL: On Traité des Arbres et Arbustes. Paris, 1815. On pl. No. 65, tome 7, figures Muscat d'Alexandria. This variety differs from our Muscat of Alexandria by having the berries less tapering, like the

"Malaga." On pl. 72, tome 7, there is a figure of White Corinth, but the bunch is too loose to be characteristic.

Pacific Rural Press: Edited by Prof. E. J. Wickson. Published by Dewey & Co., San Francisco; weekly. It contains in its pages occasional references to the raisin industry. The issue of May 5, 1877, contained an article on Huasco Grapes of Chile.

Pallas: Voyages dans pl. Provinces de l'Empire de Russie. 1, b 13, "Kyshmish" seedless raisin grapes from Astrachan.

Pierce, N. B.: The Mysterious Vine Disease. Essay read before the State Horticultural Convention in Los Angeles, March, 1890. Published in *California*, a Journal of Rural Industry, Vol. III, No. 18, pages 2 and 3, 1890.

Plinius: Historia Naturalis. Lib. xiv., cap. iv, *a*, mentions *raisins* such as Duracinæ and Amineans; cap. ii, *b*, Muscadella and Apiariæ; *c*, Corinth grapes.

Randolph, Bernard: Present State of Morea, Island of Zante, etc. 1689.

Reports of the State Agricultural Society of California: First Raisins Produced in California. Sacramento, 1863. Page 88.

Reports of the State Board of Horticulture of California: Biennial Report for 1885 and 1886; also Appendix for 1887. Sacramento, 1887.

—— Third Biennial Report. Sacramento, 1888.

—— Official Report of the Tenth Fruit-growers' Convention of the State of California, etc. Saramento, 1889.

—— Official Report of the Eleventh Fruit-growers' Convention, etc. Sacramento, 1889.

—— Annual Report of the State Board of Horticulture. Sacramento, 1890.

Richardson, Charles: Dictionary of the English Language. 1836.

Roxas, Don Simon: Essai sur les Varietés de Vignes de l'Andalusia. Gordo Blanco is here designated as the raisin grape of Malaga.

Scribner, F. Lamson: Report to the Mycological Section of the Department of Agriculture. In the Reports of the Department of Agriculture. Washington, D. C., 1886.

Stevens, W. E., United States Consul at Smyrna: Fruit Culture in Asia Minor. Pages 744 to 748 of United States Consular Reports, No. 41½. June, 1884.

Sturtevant, E. Lewis: Seedless Fruits. Memoirs Torrey Bot. Club, Vol. 1, No. 4. New York, 1890.

Tablado, José Hidalgo: Tratato del Cultivo de la Vid, y Modo de Mejoraria. Madrid, 1873. This, the standard authority on viticulture in Spanish, refers only briefly to the Gordo Blanco as the raisin grape of Malaga, and gives as synonyms Muscatel Romano and Muscatel Real, but the description of the grape is unsatisfactory.

Tavernier, Jean Baptiste: Six Voyages in Turquie, etc. 1676.

The California Fruit-Grower: Published by B. N. Rowley, San Francisco; weekly Horticultural Journal. Contained during 1889 and 1890 several articles on raisins, among others: White Muscat of Alexandria, in No. 2, Vol. VI; Statistics of Malaga Raisins; also article on Currants, by L. C. Crowe, etc.

Vernge, F. de la: Mémoire sure la Maladie de la Vigne. Bordeaux, 1853. 1 Pl.

Warner, Richard: Antiquitates Culinariæ, 1791. Mentions "The Forme of Curry," 1390, a work in which "Raysons of Coraunte" are first mentioned in English.

West, W. B.: Raisin-making in Spain. First Annual Report of the State Viticultural Commissioners. San Francisco, 1881. Pages 33 to 39.

—— Raisins and Shipping Grapes. Essay read before the Third Annual State Viticultural Convention in San Francisco, December, 1884. Published by the San Francisco *Merchant* in 1884.

Wheeler, J. H.: Bleaching Seedless Sultana Raisins. Annual Report of the Board of State Viticultural Commissioners for 1887. Sacramento, 1888.

—— Grafting to Muscats. Appendix 14 to the Annual Report of the Chief Executive Viticultural Officer for the year 1888. Sacramento, 1858. Contains reports from forty-eight grape-growers as regards their views and success with the grafting of muscats.

Wheler, Sir George: Journey in Greece. 1682.

White, T. C.: Raisins—Drying, Packing and Preparing for the Market. Report of Sixth Annual State Viticultural Convention of California. Sacramento, 1888.

Wickson, E. J.: California Fruits, and How to Grow Them. Dewey & Co., San Francisco, 1889. This, the standard work on fruit-growing in California, contains much reliable information about the raisin industry of California.

INDEX.

PAGE
Acarnania........ 29
Acres in Raisins........ 48, 169
Aetolico........ 29
Agrotis........ 101
Aidin........ 31
Albunol........ 12
Alfilerilla........ 99
Algarve........ 9
Alicante........ 10, 15
Alkali........ 72
Andalusia........ 8, 9
Antidotes for Alkali........ 74, 75
Arabs........ 22
Argentine Republic........ 59
Argos........ 29
Arizona........ 134
Armona........ 214
Arquimbau, J. D........ 21
Arundo donax........ 20
Ash-trough........ 131
Assorting........ 138, 159
Austin, M. F........ 39, 122, 210
Australia........ 11, 59
Australian Salt Bush........ 74
Average Price........ 21

Back-furrowing........ 115
Bag-holders........ 157
Bags........ 151
Bairdir........ 31
Ball, Frank H........ 213, 216
Barling, A. D........ 213, 216
Baskets........ 18
Bearing Quality........ 79
Belvidere........ 9, 10, 36
Bermuda Grass........ 74
Bidwell, Gen. J........ 44
Bittern........ 73
Borates........ 72
Boxes........ 156, 180
Brands of Raisins........ 15, 51
Briggs, G. G........ 38, 41, 42, 89, 208
Black Currants........ 90
Black-knot........ 102
Black Smyrnas........ 10
Bleeding........ 26, 128
Blowers, R. B........ 38, 42, 208, 209
Bluestone........ 95
Butler, A. B........ 20, 126, 211, 212, 216
Butte County........ 44

Calcium Chloride........ 73
Calabrian Raisins........ 9, 10, 36
California........ 97
California Dipped........ 10, 149

PAGE
California Malagas........ 10
California Raisin Districts........ 38
California Sultanas........ 10
California Sun-dried........ 10, 133
Cañezos........ 20
Canvas Covering........ 145, 146
Carabourna........ 31, 176
Carbonate of Lime........ 72, 74
Care of Currant Cuttings........ 25, 27
Care of Vines in Smyrna........ 32
Cartoons........ 156
Cascalira Currants........ 30
Castellon........ 15
Castille........ 8
Catacolo........ 30
Catcher........ 140
Caterpillars........ 100
Cephalonia........ 27, 29
Chains........ 131
Chaintre System........ 127
Chandler, S. R........ 121
Chapman, W. S........ 38
Chemicals........ 74
Chenopodium........ 74
Chesme Raisins........ 10, 31, 34, 176
Chico........ 44
Chile Guano........ 13
Chile Raisins........ 11, 36
Chios........ 23
Choice Layers........ 15
Clark, R. G........ 39
Clay for Grafting........ 26
Cleaning........ 137, 160
Cleats........ 149
Climate. 12, 17, 30, 37, 40, 41, 48, 56, 60, 67
Coast Vineyards........ 66, 67
College City........ 44
Collins, W. E........ 48
Color........ 79
Colure........ 57, 93
Colusa County........ 44
Consumption of Currants........ 29
Cooking........ 18, 139
Cooper, Elwood........ 147
Copper Sulphate........ 95
Corauntz........ 6
Corens........ 6
Corinth........ 7, 22
Corone........ 29
Cortez of Cadiz........ 8
Corynthe........ 7
Cos........ 31, 67
Cost of Valencia Raisins........ 176
Cost of Vineyards........ 28, 35, 113
Cotton Sacks........ 51

PAGE
Covering 123, 145
Cowdung 27
Crimea 38
Crocker-Hoffman Reservoir 188
Crop 40, 42, 47, 50, 54, 169
Cropping 74
Cross-plowing 115
Crow, L. C. 29
Crusades 11, 23
Cucamonga 48
Cullera 15
Cultivation 115, 131
Curing 18, 27, 30, 33, 37, 54, 58, 133, 151
Currants 6, 10, 22, 106, 109, 110, 111, 178
Cutter-sleds 116, 131
Cuttings 179

Damage to Raisins 61
Davy, Dr. 61
Dehesa Raisins 7, 9, 13, 15, 87, 90
Deilephila 100
Delano 45
Delmas, A. and D. M. 38
Denia 9, 15, 16
Dibble 130
Dipped Raisins 6, 10, 19, 33, 149
Discoloration 139
Diseases 16, 73, 93
Disposing of Crop at Denia 20
Distances of Vines 13, 18, 25, 30, 46, 104
Dodoens 7
Double Plow 114
Dowlen, E. 97
Downy Mildew 95
Drainage 84
Dried Grapes 10
Dryers 147
Drying 14, 20, 22, 33, 37, 58, 133, 139, 151
Drying Floors 14, 146, 147
Drying in the Shade 10
Dry Season 60
Duracinæ 22
Duty 177, 178

Eisen Vineyard 38
El Cajon 39, 55, 62, 63, 134, 195, 196
Elche 15
Eleme Raisins 10
Elevating the Trays 142
Equality Price 21
Equalizing 162
Erodium 99
Erythroneura 42, 98
Escondido 59
Estremadura 8
Etiwanda 48, 52
Exhausting the Soil 76
Exports 22, 34, 115, 176
Extent of District 15, 30, 45

Facing 157, 160
Fall Rains 60

PAGE
Faro Raisins 10
Feher Szagos 92
Fertilizing 75
Figliatra 29
Figs 177, 178
Filling 166
Finest Dehesa 15
First Crop 135
Flat Stacking 143
Flavor 90
Flooding 81
Floreal Vineyard 89
Fogs 46, 66
Follower 157
Foreign Districts 10
Forsyth, Wm 39, 212, 216
Fowler 45, 214
Frames 156
Freeman, George A. 89
Fresno 39, 44, 134, 184, 185, 186, 187
Frost 63
Furrowing for Irrigation 82

Gandia 16, 22
Gargalino 29
Gastuni 29
Gila River Valley 59, 134
Glauber Salt 73
Goodman, J. T. 39, 88, 211
Gordo Blanco 13, 45, 50, 87, 88
Gould, E. 41
Grading 151, 153, 164
Grafting 25, 117
Graham, George 21
Grasset, St. Sauveur 22
Grasshoppers 102
Great Reasons 5
Grecian Islands 9, 74
Gridley 44
Grocers Company 6
Guadalaviar 18
Gypsum 73, 75

Hakluyt 23, 24
Happy Valley 44
Haraszthy, A. 38
Hardpan Soils 70, 71
Harkness, W. H. 95, 96, 97
Harrowing 179
Health of Vines 79
Heap, G. H. 34, 67
Heat for Drying 139
Highlands 48
Hilgard, E. W. 216
Historical 5, 22
Hoeing 117, 131
Holland 7, 29
Huasco Raisins 36, 89
Hurdles 61

Ideal Conditions 67
Imbat 31

PAGE
Imperial Clusters 47
Imperial Dehesa 15
Importation 30, 38, 179
Injury to Raisins 65, 139
Insect Pests 93
Ionian Islands 23, 26, 61
Irrigation 17, 18, 37, 49, 54, 60, 77, 85
Italian Raisins 36
Ithaca 24, 29

Jabea 16
Jackson, Byron 150
Jalon 16
Jaraco 16
Jerrea 16
Jucar River 18

Kalamata 29, 30
Karabournou 31
Kaweah River 46
Kells, R. C. 121
Kern 45, 46, 134
Kettles 150
Kyparissia 29

Labeling Press 157
Labels 169
Labor 15
Labors of the Year 124
La Mancha 14, 65
Land Scraper 105
Land Plaster 73
Large Black Raisins 35
Large Red Raisins 35
Latitudes 60
Leaching 73
Leaf-hopper 42, 57, 98
Leon 8
Lepanto 23, 29
Lerdo 45
Levante 65
Lever-press 155
Lexias 9, 10, 15
Ligudista 29
Limits of Raisin Districts 60
Lipari 9, 22, 36
Literature 215, 216, 217, 218
Lithgow 24
Lixivium 9
Location 12, 60
Locke, J. 23
London Layers 15
Longevity of Vines 70
Loose Raisins 21, 158
Lye 19, 149
Lye-dipped 9
Lyeometer 34

Machine-dried Raisins 9
Madeira 94
Madera 45
Magnesium Chloride 73

PAGE
Malaga 7, 9, 12, 15, 91, 134, 176
Malaga (Cal.) 45
Mal Nero 64, 98
Marking out Vineyard 105
Manilla Paper 158, 180
Manuring 13
Marbella 12
McPherson Bros. 39, 55
McPherson, Robert 209
Mediterranean Basin 11
Merced 45, 46, 182
Merino 8
Mesta 8
Mildew 93
Mirabelle Vineyard 31
Mission Vines 98
Missolonghi 29
Modern Raisin Districts 11
Modone 29
Moisture 54, 66
Morea 23, 27, 29
Moryson, Fynes 24
Moors 7, 16, 22
Moss, Geo 216
Murcia 8
Musca 7
Muscatels 6, 7, 8, 9, 10, 15, 43, 87
Muscat of Alexandria 16, 50, 57, 87, 88
Mussel Slough 44

Nailing 167
Nathaligo 24
Nauplia 29, 30
Naxos 23
Neglected Vines 137
Nice, Climate of 12
Nisi 29
Northern Raisin Districts 43
North, J. W. 39, 52

Off-stalk 21
Oidium 93
Oleander 214
Olive Oil 150
Olivo 16
Olympia 29
Ondara 16
On-stalk 21
Ontario 48, 52
Orange County 39, 52, 145, 146, 189
Orland 44

Packing-frames 156
Packing-house 153, 205, 206, 207, 214
Packing Raisins 14, 20, 151, 160, 164
Palermo 44
Pantellaria 36
Paper 158
Pasas 22
Pasture Lands 8
Patras 24, 29
Pedreguer 16

PAGE
Pergos 29
Peronospora 95
Petrasso 24
Philampelus 100
Phœnician 16
Pickers 137
Picking 135, 180
Pierce, N. B. 97
Placer County 43
Planting 18, 25, 41, 53, 104
Planting-bar 88, 130
Plowing 114
Plows 131
Portugal 15
Powdery Mildew 93
Preparing Land 25
Presses 155
Prices 34, 38, 52, 58, 115, 170, 179
Prodenia 101
Production 22, 34
Profits 51, 55, 58
Pruning 13, 18, 26, 47, 124, 128, 131, 180
Pupæ 100
Pylla 30
Pylos 29

Racemus 5
Radiator 147
Rain 12, 32, 55, 61
Raisin Districts 10
Raisin Grapes 87
Raisin Packers 214
Raisins 5
Raisins, Import of 178
Raisin Vineyards 30, 38, 104
Raysins of Corauntz 23
Reasons 5
Red Currants 91
Redding 44
Redlands 48, 202, 203, 204
Red Raisins 176, 177
Red Spider 100
Retoria 16
Reversing 141
Reysin 5
Ringing the Branches 27, 123
Rinsing 150
Ripeness 135
Ripening 31, 33, 50
Riverside 39, 48, 134, 199, 200, 201
Roberts, Lewis 22
Ronda 12
Roof-stacking 143
Rooted Vines 106, 112, 179
Root-pruning 129
Rosedale 45
Rosine 5
Ross, Newton 51
Rotterdam Colony 182
Royal, Finest Dehesa 15

Quality of Raisins 18, 57, 79

PAGE
Saccharine 134
Salt 73
Salt River Valley 134
Samos 31
San Bernardino 39, 48
San Diego 55, 192
Sandy Soils 70
Sanger 45
San Joaquin Valley 44, 181
Santa Ana 14, 52, 55, 134, 145, 190
Santa Maura 24, 29
Scalding 19
Scales 154
Sea-breezes 31
Secadero 19
Second Crop 136
Seedless Grapes 9, 90
Seepage 84
Selma 45, 214
Sequero 14
Shasta County 44
Sheep's-foot 88, 130
Slanting the Trays 142
Smirna 9
Smyrna Raisins 10, 30, 176
Soils 12, 16, 25, 37, 41, 45, 49, 53, 56, 60, 67, 68, 69, 70.
Solano 41
Solis 9, 10
Spades 131
Spring Frost 64
Spring Rain 60, 62
Stabler, B. G. 88
Stacking 142, 144
Stanchio 31
Stationers Company 6
Statistics 169
Stems 136
Stemming 151, 154, 158, 180
Stevens, W. E. 32, 35, 61
Stock for Grafting 121
Strentzel, Dr. J. 138
Subirrigation 83
Subsoil 70
Suckering 129
Sulphates 73
Sulphuring 47, 121, 131, 180
Sultana Raisins 6, 9, 10, 45, 135, 177
Summer Pruning 128
Sun-dried Raisins 9, 10
Surface Water 48
Sutro, Adolph 216
Sutro Library 216
Sutter County 43
Sweat-boxes 148, 180
Sweat-house 153
Sweating 162
Sweetwater Valley 55, 59

Taking-up 143
Tehama County 44
Temperature 31, 48

PAGE
Terral 18
Thermalito 44
Thinning the Grapes 123
Thompson Seedless 10, 43, 91
Tin Boxes 158
Tools 106, 130
Tray-catcher 140
Trays 20, 148, 156, 157
Trieste 29
Trifylla 30
Trimming 167
Trucks 131, 137, 157, 160
Tulare 45, 214
Turkish Raisins 92
Turning 140, 180
Tying-over 122
Tyra 31

Uncinula 93, 94
Uva Alexandria 11
Uva Apiariæ 7, 11
Uva Muscæ 11
Uva Passa 26
Uva Zibeba 1

Valencia Raisins .. 9, 10, 15, 21, 175, 176
Varieties of Grapes 13, 35, 37

PAGE
Velez Malaga 8
Venetians 6
Vergel 16
Villa Joyosa 15
Vine Plague 96
Vostizza 24, 29
Vourla 31, 176

Ward, C. T. 89
Weed-cutter 116
Weeks, George F. 216
Weighing 164
West, W. B. 216
White Corinths 45, 91
White, T. C. .. 38, 122, 156, 209, 210, 216
Wickson, E. J. 216
Winds 65
World's Production 177

Yerly 31, 176
Yield 13, 55
Yolo 41
Yuba 43

Zante 23, 29
Zea 67

Additional Notes for 1890.

The first crop suffered considerably from mildew and climatic conditions unfavorable to the setting of the grapes. The second crop, however, is large and very good, and altogether the yield is a satisfactory one. The prices have ruled higher than before and raisins in sweatboxes have been contracted for readily at from 5½ to 6½ cents per pound or even higher. Wine grapes dried here sold for 3 to 4 cents per pound, and Malaga and Feherszagos raisins have brought from 4 to 5 cents. No such prosperous year has before been experienced by the raisin men of this State, and reports come in that many growers are realizing from $250 to $450 per acre from vines in full bearing.

The weather all through the summer has been unusually temperate and thus very favorable to the full development of the grapes, and so far the drying weather has been very favorable for the proper curing of the raisins. Many new packing houses have been established, and the crop is being better cared for than in previous years. The health and general condition of the vines is better than it was last year and the vine plague is less virulent, and according to some reports even on the retrograde. The demand for the raisin product has never been as large as now and there will apparently be no surplus left over, as the demand is rapidly increasing. The above refers especially to the central part of the State, to Merced, Fresno, Tulare and Kern counties, where the prosperous season will encourage increased planting. In Southern California the crop will be fair both in quality and quantity. In El Cajon valley it is reported as very good, and as being one-half larger than last year. Prices here ruled to begin with at from 4½ to 5 cents but rose rapidly to 5½ and 6 cents in sweatboxes.

The duty on raisins has this fall been raised from 2 cents to 2½ cents per pound, which insures an additional profit to the raisin men.

Rain-fall of 1889-90.—The rain-fall of 1889-90 in the Central and Northern raisin districts of California was as follows:

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Total.
Fresno.	3.10	1.43	3.80	2.16	.65	.92	.29	.25	12.60
Tulare.	4.17	.43	2.60	2.75	.74	.81	.22	.20	11.92
Kern	2.04	.22	1.75	1.20	.16	.24	....	.06	5.67
Yolo	8.14	3.04	9.62	6.36	3.69	3.35	1.60	2.21	37.41
Yuba	5.87	3.73	9.01	4.44	4.65	6.71	1.85	2.55	38.81

The above figures are from the "tables of rainfall in the principal agricultural counties" of California, compiled and published by Albert Montpelier, Esq., Manager of the Grangers' Bank, San Francisco, but no report is made of the rainfall in the counties of San Bernardino and San Diego, and statistics of those counties are not at hand.

Duty on Raisins.—The revised tariff of 1890 makes the duty on imported raisins 2½ cents per pound, an increase of ½ cent on the old schedule. Currants, Zante and others, are now on the free list and pay no duty.

RAISIN BOXES, RAISIN TRAYS, SWEAT BOXES.

KINGS RIVER LUMBER CO.,

SANGER, FRESNO COUNTY, CAL.

San Francisco Office, 109 California St., San Francisco, California.

Manufacturer of and Wholesale and Retail Dealer in
all kinds of

Lumber, Boxes, Doors, Sash, Blinds and Mouldings.

This Company has at Sanger the best appointed Box Factory, Door, Sash and Blind Factory and Planing Mill in the State.

Special Mill Work of all kinds Estimated on and Furnished.

BOXES

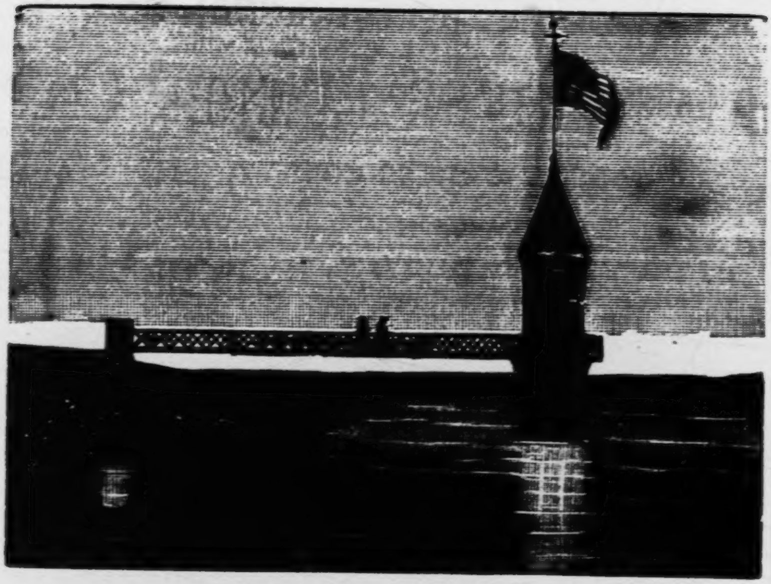
ALL KINDS OF BOXES MANUFACTURED AND IN ANY QUANTITY
RAISIN AND ORANGE BOXES A SPECIALTY.

This Company manufactures, at its works at Sanger, Raisin Boxes of all sizes from the very best of Sugar Pine, cut from its own lands, which for quality of material, perfection of workmanship and printing have no equal.

THE COMPANY HAS AT ALL TIMES IN STOCK AND FOR SALE

LUMBER OF ALL DESCRIPTIONS, GRAPE STICKS, POSTS, SHINGLES, SHAKES, PICKETS AND LATH.

ORDERS SOLICITED AND PROMPTLY EXECUTED.



WATER TOWER AT LAKE YOSEMITE.

YOSEMITE COLONY.

This Colony is two miles from Merced City, California. Merced, from its fine fountains, is now known as "The Fountain City." It is the county seat of Merced County. The Southern Pacific Railroad, a transcontinental line, passes through this place, from San Francisco to New York. The Oakdale Line from the north also starts from Merced City, giving direct communication by rail with Sacramento Valley, Oregon, Washington, and all points north. Merced City is the nearest point in the San Joaquin Valley to the great Yosemite Park, and commands the only passable railroad route to this "World's Greatest Wonder." Merced City also lies in a direct line from Yosemite, through Pacheco Pass, in the Coast Range, to Del Monte, on the Bay of Monterey. These great natural advantages are now being developed on a scale commensurate with nature's own great gifts. The largest and most costly irrigating canal in the United States has been completed, and is now discharging the crystal snow waters, fresh from the Yosemite Falls, into Lake Yosemite, one mile from this colony. Thus we find ourselves in the possession of a combination of nature and art, which present advantages in climate, health, water privileges, wealth of soil and their productions which are not as fully possessed by any other locality in California. And, as an enduring crown to our prosperity, we point to the late Act of Congress of the United States in setting apart the Yosemite Park, with her giant Sequoia and sugar-pine forests, insuring and perpetuating the annual snow and rain on the watershed of our canal system. The Yosemite Colony contains about 5,000 acres, and is beautifully situated by the side of Lake Yosemite, and bounded on the north by the fine Colony of Rotterdam. "The Yosemite" was the first colony subdivided and placed on the market after the perfection of our irrigating system, two years ago; and a large main ditch was then brought by the proprietor from Lake Yosemite to and through these lands. Young Orange Groves, Almonds, Prunes and Apricots, Figs, Pomegranates, Peaches, etc., etc., have already been planted; also several fine young Raisin Vineyards, of only two years' growth, which this autumn produced raisins of the most superior quality. The soil is from four to twelve feet in depth, with under strata of heavy, rich clay, which will always insure an abundance of moisture, when with proper irrigation. These lands are all free from alkali, and about one-half of them situated on the rich, alluvial plain; the other half are gently rolling, and extend into the red gravelly soils, so much prized for Olives, Oranges, Lemons, Wine Grapes and Strawberries, while the lower levels are especially prized for the famous Muscat Raisin Grape, as well as for the Prune, Almond, Pear, Apricot, Alfalfa and Vegetables. Merced City, situated one hundred and fifty miles from San Francisco by rail,—one hundred miles from the coast,—in the center of the San Joaquin Valley, is also the exact geographical center of the State—north, south, east and west.

We are not offering you land that has not been thoroughly tested to produce what we advertise. Neither are we offering you hog wallows, salt grass and alkali flats; but we offer you a block out of one of the richest fields of California. As to health, we challenge the whole world to surpass us. Our locality is free from malaria; and fogs in summer and autumn are unknown in this dry and equable climate. Not only is our locality free from fog, and fanned by the gentle invigorating sea-breezes from the south and southwest, but we are protected from the harsh, desiccating northwest winds, offering a retreat to the weak and ailing; and its rich and attractive location contributes greatly to its charms.

For scenic beauty it has but few, if any, superiors in California. Standing at the lake, or on any other elevated point on the Colony, a most inspiring panorama is presented to the eye. The vision reaches one hundred and fifty miles south and east, and takes in the ever snow-capped Sierra Nevada; thence south and southwest we follow the long blue line of the Coast Range to the Mt. Diablo, one hundred and thirty miles to the northwest, in the vicinity of San Francisco. Looking to the north and east, you see looming up the grand Sierra Nevada, with its mantles of perpetual snow, seemingly so near in the pure air that, although it is one hundred miles to the summit, strangers are almost tempted to quit the green colony fields and visit them as an afternoon stroll.

A fine school-house has been erected on the Colony, at a cost of $5,000, and is now in good working order. Trees of one and two years' growth border most of the avenues, including Palms, Locust, Olive, Magnolia, Eucalyptus, Mulberry, etc., etc.

Under our irrigation system the owner of the land purchases water from the Canal Company, which is filed in the County Recorder's books, and is then inseparable from the land, and is always conveyed as a part of the realty.

We now offer you this land, together with perpetual water-right, at from $150 to $200 per acre, according to quality and location. No land will be deeded to any persons except actual settlers. As inducements to families, we will plow and prepare the land ready for planting, as our aim is to settle these lands with families. Payments may be made in installments to suit purchasers. We make the following liberal offer to those who do not feel able to pay cash for the land: The purchaser is to build and occupy a neat and substantial cottage; also build all needed outhouses, paint or whitewash the same, and plant the land to such trees and fruits as may be agreed to be the best. This done the first payment will be deferred for five years, one-quarter to be paid annually thereafter. Said sum agreed to be paid to bear eight per cent interest per annum from date of sale. Deed will be given purchaser when he builds and plants, and the purchase price secured by mortgage on the premises. A family with from $1,500 to $2,000 to make their improvements can settle down and safely wait until their fruits or raisin vineyard come into bearing. The whole purchase price should be produced from the lands the fifth year.

For those who have not experience, or are desirous of avoiding the expense of team and tools, we will plant, cultivate, irrigate and care for their orchard and vineyard until it comes into bearing. It will be worth about $25 per acre to furnish and plant the first year, and $10 to $15 per acre each year thereafter. The above figures mean compensation for good, first-class work.

We have already some fine planted tracts for sale, embracing Raisin Vineyards, that will come into bearing next year (1891), also young Orange Groves, as well as deciduous Fruit Orchards. We also aim to keep a vacant cottage on the Colony, for the accommodation of each newcomer until such time as he can build on a lot of his own choice. Deciduous Fruit Trees can be planted commencing January 1st, and as late as the 1st of April. Orange Trees in March and April. Grape vines, rooted or cuttings, should be planted in February or March. Peaches and Apricots will bear light crops the third year. Pears, Almonds, Figs and Oranges will begin to bear the fourth year. Raisins begin to bear, from the cuttings, in the third year. One year's time is gained by planting rooted vines. It is safe to expect $50 per acre the third year from rooted vines, and $100 per acre the fourth year, at least, gross product. A respectable cottage should be built, with from four to five rooms, at a cost of from $500 to $800; barn, $200. One pair of horses and harness, $150; milch cow, $25; tools, $25; wood is high, $7 per cord; flour, $3 to $4 per barrel of 200 lbs.; beef, from 6 cts. to 10 cts. per lb.; hens, from $5 to $7 per dozen; eggs, from 25 cts. to 50 cts. per dozen; building lumber, $25 per M. in the valley or farming sections of the State. Male labor on the farm, $30 per month, except four or five months in the summer, when they receive $1.50 to $2 per day. Female labor has never been ample, and commands from $20 to $30 per month. Families coming out here can bring with profit all clothing, bed-clothing, table cutlery and such articles as would not be bulky. Large furniture or farming implements will not bear transportation.

The very favorable conditions existing for small farming in this rich valley of California, where water can be obtained to render crops certain, are not generally known in the East and Europe. For instance, our breadstuffs (wheat) must be shipped around Cape Horn to Liverpool to find a market. Beef and pork the same. Our wool also has to go around the Horn or across the Continent. The consequence is that the fruit farmer eats the cheapest bread and beefsteak of any people in the world. Our woolen mills are able to furnish the finest and cheapest clothing worn. Labor is high, and everything the small farmer produces is high, including poultry, vegetables and fruit, and will always be so. The big farmer can't get at this business with his steam engine and long sickle. We can close Europe and the United States out of the fruit-producing business, and force them to become consumers. Why? Because of the certainty of our crops, and because we have the whole valley for a drying house.

Address or call upon the undersigned, owners and proprietors,

V. C. W. HOOPER & SON,
MERCED, MERCED COUNTY, CALIFORNIA.

EISEN & STEWART,

Real Estate and Horticultural Land Brokers,

◆ DELANO, ◆

KERN COUNTY, - - - - CALIFORNIA.

WE make horticultural lands a specialty, and offer special bargains in the Kern and Tulare Irrigation District, and in the Poso Irrigation District. These lands are suited to Olives, Raisins, Oranges, other fruits and alfalfa. They are now cheap, but will soon rise in value, and become as high priced as any in the State.

We also attend to the business of absent owners, and we guaranteee satisfaction.

Correspondence solicited.

THE

YOST WRITING MACHINE

Acknowledged by Experts to be The Best.

THE YOST is full of New and Valuable Improvements, and is guaranteed to do as represented.

FOR CATALOGUES, TESTIMONIALS, ETC., SEND TO

J. P. MIGHELL & CO.

413 MONTGOMERY STREET,

SAN FRANCISCO, CALIFORNIA.

Thompson's Seedless Grape

MAKES ABSOLUTELY

✣ SEEDLESS ✣ RAISINS ✣

The very best for Culinary Use!

This Grape has been thoroughly tested in California, having been grown and raisins made of it, in Sutter County, for the past fifteen years.

It is far superior to the Sultana, being much sweeter, a heavier cropper, more easily dried, and ripens earlier.

For rooted vines, guaranteed true to name, address,

B. G. STABLER,
YUBA CITY,
Sutter County, California.

Prices reasonable; given on application for both one and two-year old rooted vines. Will also send *sample of raisins, if desired.*

Described by Prof. Eisen.

In a communication to *California*, a Journal of Rural Industry, May No., 1890, entitled "With the Fruit Growers in Sutter County," Prof. Eisen thus refers to Mr. Stabler, and his work: "Mr. B. G. Stabler makes a specialty of dried peaches and seedless raisins, and has succeeded well with both. The principal raisin-grape of this vicinity is the little-known seedless grape, Lady Decoverly, here known as the Thompson Seedless, he being the first to grow it. Years ago, about 1872, this gentleman saw advertised in an Eastern Catalogue a seedless grape, said to come from Constantinople, and was called the Lady Decoverly. It proved to be very different from the common Sultana, being of yellow color, and of oblong shape. It is certainly strange that this singular variety of grape should have existed here so many years, and failed to attract general attention. It is an enormous bearer, heavier even than the Sultana, and ripens early in August. It makes very choice raisins for cooking purposes. The color is similar to that of the Muscatel, and makes a raisin of beautiful color. Among other novelties in the way of fruit, Mr. Stabler has a Chance Seedling Apricot, which promises to be something extraordinary. It is not yet in bearing. * * * but think of apricot leaves six inches in diameter, and limbs many times as long and strong as those of ordinary apricot trees," etc.

FRESNO AND MERCED

COUNTY LANDS

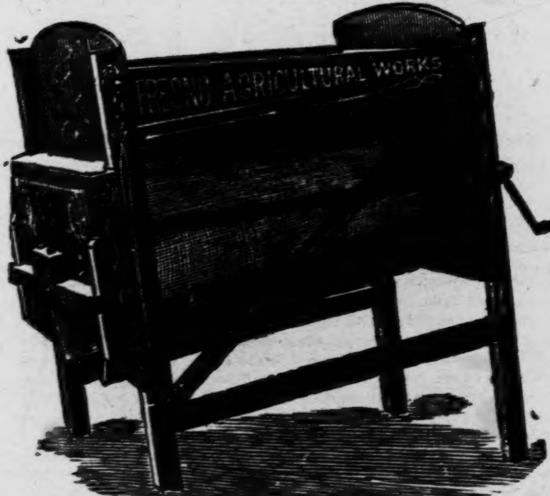
TO RENT AND FOR SALE.

75,000 ACRES OF WHEAT AND SUGAR-BEET LAND in the above counties to rent for a term of years; also **100,000 acres** of fine Raisin, Fruit, Alfalfa and Sugar-Beet Land, with water for irrigation, for sale in tracts of from twenty acres to large tracts suitable for colony purposes.

For particulars apply to

E. B. PERRIN,
402 Kearny Street,
SAN FRANCISCO.

FRESNO AGRICULTURAL WORKS



MANUFACTURERS OF
Raisin . .
Machinery;
ALL KINDS OF
Vineyard Tools
LEVELING and
CANAL SCRAPERS.

SEND FOR
Descriptive
Catalogue.

ADDRESS,
JAMES PORTEOUS, FRESNO, CAL.

GUSTAV EISEN,

HORTICULTURAL LAND AND RAISIN EXPERT.

* * *

I have had twenty years of experience in fruit growing, raisin-grape growing, raisin making, and in other horticultural industries, in California, Central America, Mexico and Europe. I make it a specialty to assist and advise those engaged in horticultural pursuits. Whether you wish to select land or plant it to vines and trees, whether you are a capitalist, the member of a syndicate or a farmer, my services will be a thousand times more valuable to you than the reasonable charge I make for them. If you are not acquainted with land, soil, climate or the profits of the horticultural industry you intend to engage in, you will find it to your advantage to engage me to make you thorough and truthful reports.

All matters strictly confidential and charges reasonable.

Address,

GUSTAV EISEN,

CALIFORNIA ACADEMY OF SCIENCES,

San Francisco.

YOSEMITE | ILLUSTRATED IN COLORS

PUBLISHED BY

H. S. CROCKER & COMPANY

215 BUSH STREET, SAN FRANCISCO

THE FINEST HOLIDAY GIFT | *It has no rival. Each book is wrapped in heavy paper and enclosed in a specially made box, suitable for presentation to friends. For shipment East, we provide an extra heavy box. Size of book, 12 x 16 inches.*

Full Morocco, or Undressed Kid	$15.00
Half Undressed Kid	12.50
Full Cloth, elegant paper edges	11.00

* * *

H. S. CROCKER & COMPANY

215, 217, 219
BUSH STREET
SAN FRANCISCO

Wholesale Stationers
Printers, Lithographers and Bookbinders

A FULL AND ELEGANT LINE OF

FRUIT AND RAISIN LABELS AND PAPERS ALWAYS ON HAND

OUR SPECIALTIES ARE

Incorporation Outfits *Bank Supplies* *Copperplate Engraving of Visiting-Cards and Wedding Invitations*
Map and Pamphlet Printing
Stationery Outfits

CORRESPONDENCE SOLICITED

THE FRUIT REGION OF MERCED.

The fruit lands now offered for settlement by the Crocker Land and Water Company are situated in the very center of California. Besides being so favorably located, they offer advantages which are not possessed by any other lands in the State. The fifty-five thousand acres, which are now for the first time subdivided, consist of virgin pasture and wheat lands, which have become too valuable to be devoted to their former use. They are now being irrigated by the most expensive and magnificent irrigation system on the continent, by a canal capable of carrying 4,000 cubic feet of water per second, and by the artificial lake Yosemite, the most extensive irrigation reservoir ever built in America. The water from this system is abundant and continuous; it comes from the snow-capped Sierra, from the Falls of the Yosemite, and will suffice to irrigate and fertilize hundreds of thousands of acres more than are offered for sale.

These fruit and horticultural lands are situated in the warm belt of the foot-hills of the Sierra Nevada, protected by sheltering hills, traversed by natural creeks and surrounded by the grandest scenery known to man. The famous Yosemite is almost within sight, and the high-peaked Sierra can be reached in a day's journey. The Coast Range, with Mt. Diablo, is in full view, while the fresh breezes from the San Pablo Bay temper the climate, and contribute to make it one of the finest, most salubrious and most enjoyable in the world. Through the irrigation water always at the command of the horticulturist, our lands are being transformed into beautiful orchards, vineyards and meadows. The peach, the prune, the apricot, the pear and the raisin-grape are

made to flourish, and the olive to produce its valuable oil, the orange and the lemon their golden fruit. The colonies already established are situated in the thermal belt of the Sierra, in the finest citrus region of the State, in a district equal to the best anywhere, and in a territory remarkable for its earliness and productiveness. Every variety of temperate and semi-tropical fruit is now growing within sight of the colonies,—the almond, the olive and orange upon the more elevated land; the peach, the prune, the apricot, the pear and the raisin-grape upon that of a more alluvial nature. The Rotterdam Colony contains now over a hundred settlers from Holland; other colonies are being established by English and American farmers, by doctors, lawyers and professional men of every station in life. The people whom we invite, and who have responded to our call, are the most desirable, the most intelligent, the most energetic and the most refined classes. They are now building up horticultural communities of the most prosperous nature.

The lands we offer are situated six hours by railroad from San Francisco. They are traversed by two railroads, and the principal colony is only four miles from Merced City, the county seat, while some of our land joins, and actually surrounds, that town. Our prices are low, and our terms very reasonable. We offer various grades of land, all eminently suitable for the highest state of horticulture, at prices ranging from $75 to $175 per acre, with water.

For particulars address the

Crocker-Huffman Land and Water Company,

MERCED,

Merced County, Cal.